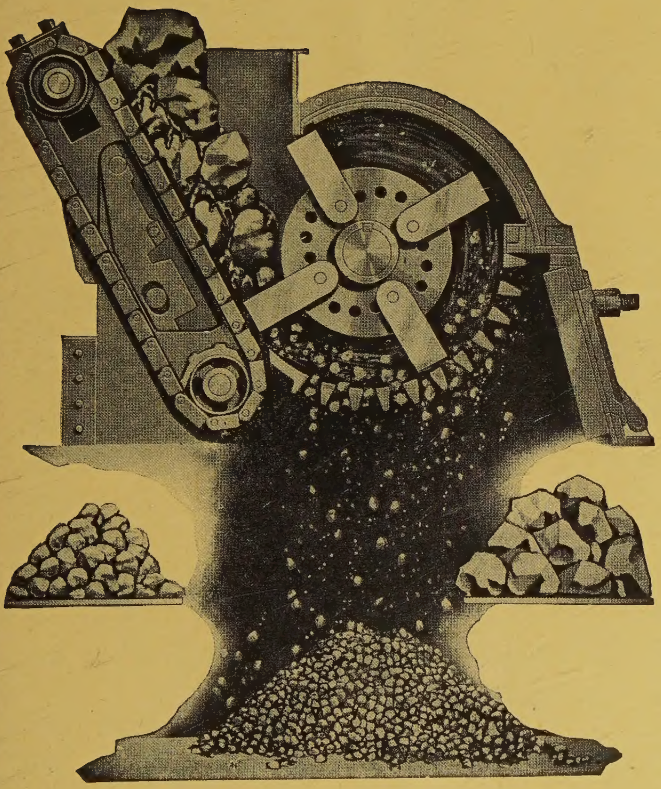
MILL SECTION of
Concrete

Dixie Hammermills

for cement, clay, shale, silica sand, gypsum, iron ore, sintering plant and quarries



WHETHER you want to reduce quarry feed or rejects from sizing screen we have a hammermill to meet the need.

Whether sticky or wet, regardless of moisture, we have the Dixie Moving Breaker Plate (Patented) Non-Clog Hammermill.

If quarry work making ¾″ to 1¼″ rock the standard breaker plate hammermill.

(A real testimonial.) One of America's largest cement companies has recently purchased their SIXTH Dixie Hammermill.

Made in 28 sizes.

Write for full information

DIXIE MACHINERY MFG. COMPANY

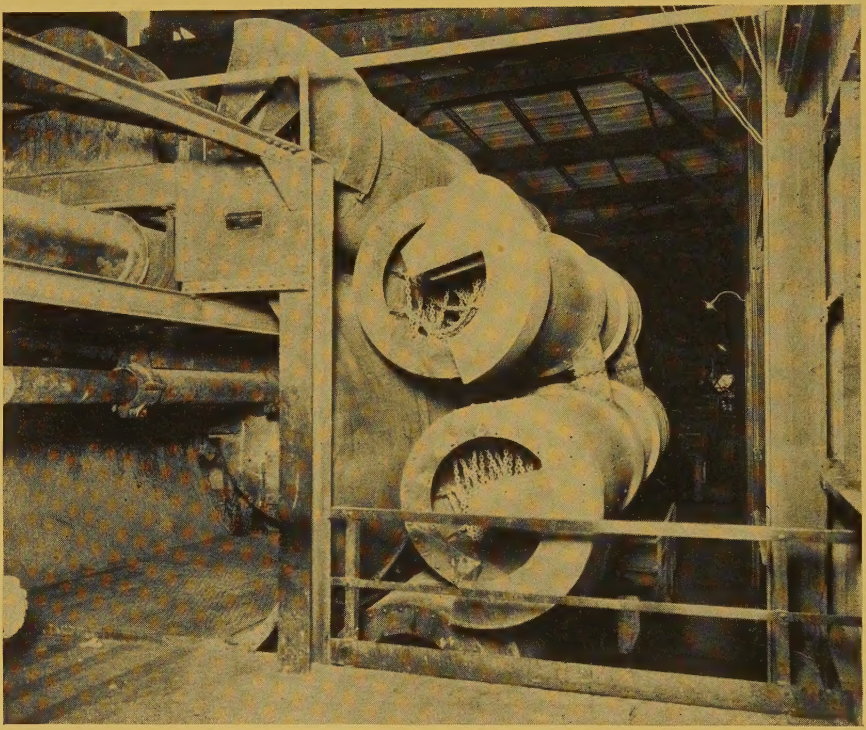
4209 Goodfellow Avenue — — — St. Louis, Missouri

Foreign Department, 104 Pearl Street, New York City
Chicago Office: 236 North Clark Street
New York Office: 104 Pearl Street
Pacific Coast Office: 2411 East 26th Street, Los Angeles

Index to Advertisers on Page 83 of This Section

Two Miles of Rotary Kilns

During 1929, the Smidth organizations sold more than ***two miles*** of rotary Unax kilns with a total yearly output of more than 3,000,000 tons of portland cement clinker. Unax kilns having a yearly production of more than 10,000,000 tons are now in operation. Among these are the largest kilns so far constructed.



The Unax Kiln

The reason for the enthusiastic reception given this combined kiln and cooler may be found in its many advantages over the standard types, such as increased fuel economy, effective cooling, improved operation of kiln, lower installation cost, etc.

Write for information regarding the Unax Kiln for new installations or the Unax Cooler as applied to existing kilns

F. L. SMIDTH & COMPANY

ENGINEERS

225 Broadway ~ ~ New York, N. Y.

Index to Advertisers on Page 83 of This Section

MILL SECTION of

Concrete

The Cement Mill Edition of Concrete is edited exclusively for those interested in the manufacture of cement. Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Cement Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition. The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

Volume 37 September, 1930 Number 3

CONTENTS

The Chemistry of Cement Manufacture 85

Alton J. Blank tells his conclusions regarding the effect of silica on fuel and power consumption and its influence on the finished product.

Bulk Cement Shipped in Special Containers *(Illus.)* 89

Containers used elsewhere prove practical in shipping cement.

Safety Mark for World Set by Cement Industry *(Illus.)* 91

J. B. John, active in company and association safety work, tells of accident prevention activities and the value of some of the newly established mediums employed.

Editorial 95

Colored Cement or Cement Colors.
Seeing Five Years Ahead.

Self-Unloading Cement Carrying Vessel for Canadian Concern *(Illus.)* 96

A. C. Blackall describes the method of carrying the cargo and the diesel-electric propelling machinery installed.

Estimation of Free Lime in Set Cements 99

Calorimetric method employed to determine free lime.

Chart to Determine Cost of Operating Electric Appliances and Motors *(Illus.)* 101

Cement Statistics for July *(Illus.)* 102

Men and Mills 103

Some brief items of interest.

Mill Equipment 104

With the Manufacturers 105

Decomposing Aluminous Silicates for Chemical Analysis 106

In the Construction Section

~

Paving Contracts and Contemplated Construction at High Figures 20

New Books and Pamphlets 23

An Index of Building Costs 24

Current Activities of Organized Groups 26

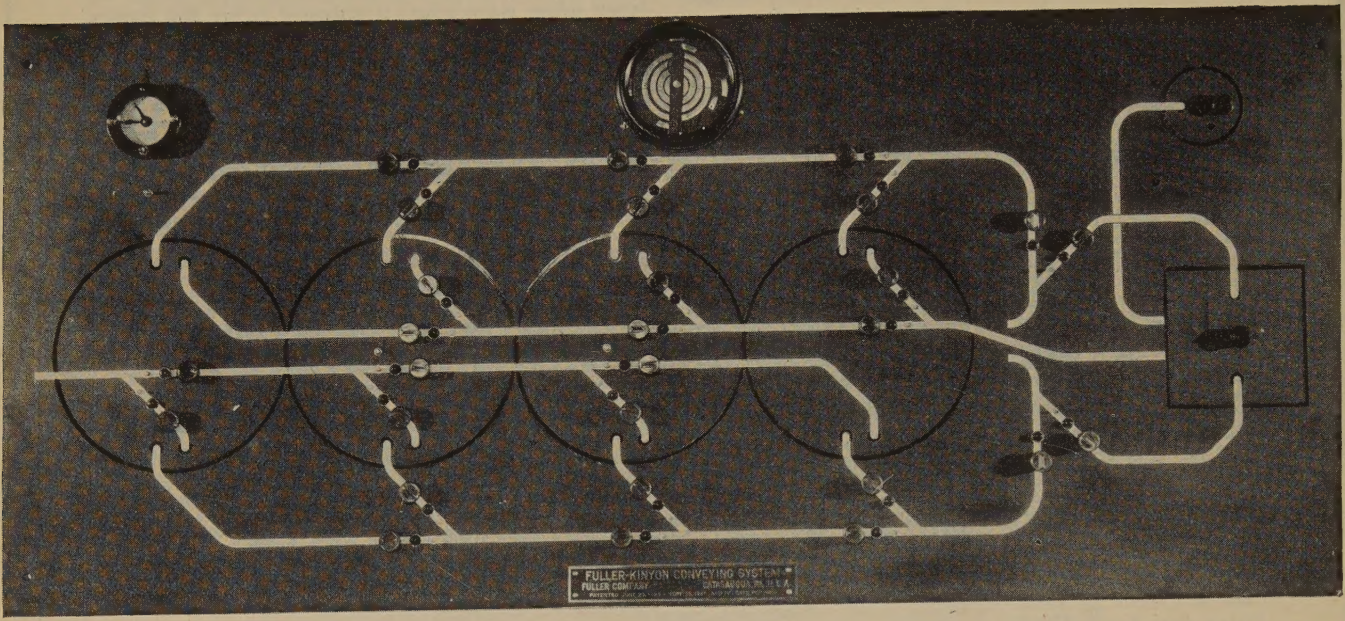
Copyright, 1930, by Concrete Publishing Co.

INDEX TO ADVERTISEMENTS

Allis-Chalmers Mfg. Co. 107
Autocar Co. 11
Babcock & Wilcox Co. 108-109
Bradley Pulverizer Co. 117
Burrell Engineering & Construction Co. 116
Caldwell & Son Co., H. W. 113
Chemical Rubber Co. 106
Dixie Mchy. Mfg. Co. 81
Du Pont de Nemours & Co., Inc., E. I. 110-111
Edge Moor Iron Co. 115
Engineering & Designing 78
Fuller Co., The 84
Fuller Lehigh Co. 114
Goodyear Tire & Rubber Co. 118
Jones Fdry. & Mch. Co., W. A. 117
Kritzer Co., The 78
Meade, Richard K., & Co. 78
Schaffer Poidometer Co. 116
Smidth, F. L., Co. 82
Super Cement Co., The 80
Texas Co., The 112
Timken Roller Bearing Co., The Front Cover

FULLER~KINYON SYSTEM

for Mixing and Blending Raw Material



Master Control and Signal Panel in a new dry process plant. This panel co-ordinates the pumping systems handling the mill stream, kiln delivery and circulating loads.

The economic advantages of the dry process are retained in a number of representative plants using the Fuller-Kinyon Mixing and Blending System. The quality and uniformity of the finished cement is not exceeded by the best wet process control. In its application to old plants, kiln production has been increased and coal consumption decreased.

The conveying systems transporting materials from mills to raw storage bins and from storage bins to kiln bins form a part of the mixing system, thus reducing installation costs and power requirements.

We will be glad to make recommendations, based upon our experience with operating installations, to meet your specific plant requirements. Estimates and layout suggestions will be furnished upon request.

Other Products

FULLER-KINYON CONVEYING SYSTEMS for transporting dry, pulverized materials from mills to storage, from storage to packing and process bins and for bulk loading of cars and boats.

THE AIRVEYOR—a pneumatic system for conveying finely divided, crushed and granular materials — especially recommended for unloading cars and boats.

ROTARY AIR COMPRESSORS. Single and Two-Stage. Compressors are furnished for pressures up to 170 lbs. gauge.

Fuller Company

CATASAUQUA, PENNA. U. S. A.

MILL SECTION of

Concrete

Vol. 37 Chicago, September, 1930 No. 3

The Chemistry of Portland Cement Manufacture

Effect of Silica on Fuel and Power Consumption—Influence on Finished Cement — Reducing the Insoluble Residue—Conclusions Drawn From Practical Experience in New Series by Alton J. Blank

I—Effect of Silica (SiO_2)

By ALTON J. BLANK
General Superintendent and Supervising Chemist, Compania de Cemento Portland "Landa," S. A.
Puebla, Puebla, Mexico

Here is presented the first of a series of several articles on the chemistry of portland cement manufacture, by a writer well known to the industry as an authority on the subject. These articles will constitute an important contribution to the literature on cement manufacture.

The chemical composition of the raw mix has a surprisingly important influence on the manufacturing costs and quality of portland cement. Fuel and power consumption may be directly affected. The finished product is affected in matters such as the time of set, rate of hardening, durability under severe exposure conditions, and in other respects.—The Editors.

THE percentage of silica present in a portland cement has a direct influence on its manufacture and quality. The silica ingredient of the raw mixture is derived from clays, shales, and in some cases from cement rock, slag and similar materials. These materials furnish the "acid" constituent of the mixture, while limestones, chalk, oyster shells and similar materials furnish the "base" constituent of the mixture. These compounds are formed at the high temperature in the kiln required for their combination.

In the case of the "acid" component of the raw mixture, it is usually claimed that such materials are suitable for portland cement making purposes when, upon being finely ground and thoroughly mixed with calcium carbonate, and this mixture subjected to the ordinary high temperature attainable in the usual laboratory kiln or furnace, they will, when treated with hydrochloric acid and sodium carbonate, show little or no insoluble residue.

When tested as outlined above, some investigators insist that there should be no insoluble residue present in the mixture, while other more lenient investigators allow a maximum of ten per cent.

Other things being equal, it is generally found that raw mixtures containing a high percentage of silica are found to be hard to burn in the kiln, yield low kiln outputs and consume a maximum of fuel. However, upon being subjected to extreme fine grinding, these mixtures are found to combine more readily in the kiln, thus suggesting that the fineness of grain has a direct bearing on the reaction of the silica with lime, and upon the temperature required for proper combination of the materials in the kiln.

Chemical Composition

To the end of determining the influence of the fineness of an "acid" material upon its combination with calcium carbonate at high heat, a clay having the following chemical composition was selected by the writer for the experiment:

	Per Cent
SiO_2	49.20
Al_2O_3	16.12
Fe_2O_3	4.08
CaO	10.40
MgO	5.28
Loss	13.30

A sample of the fine clay as received from the quarry, when washed through the No. 100 mesh screen, was retained to the extent of 33.0 per cent, and upon the No. 200 mesh screen it was retained to the extent of 49.0 per cent. A microscopic study of that clay retained on the No. 100 mesh screen showed it to be composed of round grains of silica, as did the examination of the material contained on the No. 200 mesh screen. That clay which passed the No. 200 mesh screen was found to be composed of flat flakes, and on being mixed with water it was of a very plastic nature.

A sample of the unground, natural clay, retained on the various meshed screens, on being mixed with calcium carbonate and heated to a constant high temperature, upon being tested for insoluble matter, showed the following:

Test No. 1

Clay Passing Screen No.	100 Mesh	150 Mesh	180 Mesh	200 Mesh
And Retained on Screen No.	150 Mesh	180 Mesh	200 Mesh	----
Per cent of insoluble residue	22.4	20.0	19.0	8.2

A sample of the ground clay, retained on the various meshed screens, on being mixed with calcium carbonate and heated to the same constant, high temperature, upon being treated for insoluble matter, showed the following:

Test No. 2

Clay Passing Screen No.	100 Mesh	150 Mesh	180 Mesh	200 Mesh
And Retained on Screen No.	150 Mesh	180 Mesh	200 Mesh	----
Per cent of insoluble residue	12.6	11.0	8.7	3.9

In this particular experiment, Test No. 1 shows quite strikingly the effect of size of grain of silica upon its reaction with lime, and confirms the general belief that the coarser the grain the less its affinity for combination.

Reducing the Insoluble Residue

Test No. 2 further confirms the belief that crushed, irregular particles of silica have a greater affinity for combination with lime at a high heat than do the round, uncrushed grains of silica of the same screen fineness, and shows that, with the clay under study, where the better combination with the other ingredients of the raw mixture in the kiln is desired, the fineness should never be permitted to be less than 180 mesh.

In other tests, utilizing Ottawa silica sand ground to various screen finenesses, the above results were closely checked.

In other tests performed by the writer with various types of "acid" materials, on a cement plant scale of experimentation, high insoluble residue content in the resulting cements have been pulled down to a minimum through the medium of extreme fine grinding of the raw mixtures. However, where the high insoluble residue content in the cements was due to underburning of the mixtures in the kiln, this was remedied through longer and harder burning of the mixtures.

Coarse grinding of highly siliceous raw mixtures results in their combining with difficulty in the kiln, thus retarding kiln outputs and requiring a maximum of fuel in their conversion to clinker. If improperly burned, the resulting cement is of an unsound nature and has poor strength, besides having its setting and hardening properties affected.

Differences in Raw Materials

Generally speaking, raw materials having the greater percentages of their silica in the soluble form are to be preferred to those raw mixtures containing insoluble silica, since the former combine most readily in the kiln, while the latter do not unless subjected to extreme fine grinding. To that end certain blast furnace and smelter slags are to be preferred to the usual clays and shales.

Other things being equal, tests will show that extremely fine grinding of highly siliceous raw mixtures pays dividends through increased kiln capacities, fuel economies, and the production of a sound, high quality cement that meets no rejection on the market.

However, it is usually to be found that highly siliceous cements, when compared with low silica cements, are harder to burn in the kiln, requiring greater fuel consumption, yielding lower kiln outputs as well as mill grinding outputs, and are a more expensive cement to manufacture. High silica cements are usually of a slow setting and hardening nature; and while their strengths are somewhat below the average at ages up to seven days, they show good increases in strength thereafter.

As a basis of comparing the manufacture of a comparatively low silica cement and an extremely high silica cement, comparative results, as taken from the monthly reports of two cement companies manufacturing cement by the wet process, burning fuel oil in kilns of the same diameter and length, and with other operating conditions being more or less comparable, are as follows:

	Low Silica Data Plant No. 1	High Silica Data Plant No. 2
Average per cent raw fineness through No. 200 mesh	90.1	90.6
Average per cent water in slurry	43.1	42.7
Average kiln outputs, bbls. per hour	44.9	43.1
Average B.t.u. consumption per bbl.	1,693,660	1,852,300
Average power consumption per bbl., in kwh.	13.4	18.1
Chemical Analyses—Average Cement		
SiO_2	19.94	23.66
Al_2O_3	8.28	5.77
Fe_2O_3	3.78	2.50
CaO	63.64	64.36
MgO	1.09	0.85
SO_3	1.97	1.79
Loss	1.12	0.90
SiO_2/R_2O_3	1.65	2.84
$CaO/SiO_2\&R_2O_3$	1.99	2.01
Average cement fineness through No. 200 mesh	82.2	82.5
Average initial setting time	3 hr. 22 min.	3 hr. 11 min.
Average final setting time	5 hr. 34 min.	6 hr. 09 min.
Average 1:3 mortar tensile strength—		
7 days	339 lbs.	297 lbs.
28 days	414 lbs.	426 lbs.
3 months	416 lbs.	456 lbs.

As a further basis of comparison, the results obtained at a dry-process cement plant during the periods when both comparatively high and low silica cements were manufactured, are given herewith:

	Low Silica Data	High Silica Data
Average raw fineness, per cent, through No. 200 mesh	80.7	83.2
Average kiln outputs, bbls. per hour	71.3	53.1
Average B.t.u. consumption per bbl.	1,394,840	1,569,690
Average power consumption per bbl., in kwh.	19.4	20.6
Chemical Analyses—Average Cement		
SiO_2	20.66	21.80
Al_2O_3	7.31	6.36
Fe_2O_3	2.65	2.32
CaO	62.16	61.82
MgO	3.34	3.52
SO_3	1.69	1.81
Loss	2.04	2.18
SiO_2/R_2O_3	2.06	2.46
$CaO/SiO_2\&R_2O_3$	2.02	2.02

Average cement fineness through No. 200 mesh	82.8	82.3
Average initial setting time	2 hr. 45 min.	3 hr. 10 min.
Average final setting time	5 hr. 30 min.	6 hr. 55 min.
Average 1:3 mortar tensile strength—		
7 days	348 lbs.	304 lbs.
28 days	426 lbs.	435 lbs.
3 months	458 lbs.	467 lbs.

Influence of Silica Summarized

Other things being equal, the following may be said of the part played by silica in the manufacture and in the quality of a portland cement:

(1) Highly siliceous raw mixtures are hard to burn in the kiln, requiring a maximum of fuel for a minimum of output.

(2) Highly siliceous raw mixtures, unless finely ground, combine with difficulty in the kiln, and result in cements containing high insoluble residues.

(3) Siliceous raw mixtures containing their silica in the soluble form combine more readily in the kiln than do raw mixtures containing the same percentages of silica present in the insoluble form.

(4) Siliceous clinker is uniformly small in size.

(5) High silica cements are of a slow setting and hardening nature.

(6) High silica cements are usually sound, and the more siliceous the cement is, the more resistant it is to all kinds of influences.

(7) High silica cements yield strengths slightly below normal at ages up to seven days, but show good increases in strength thereafter.

The above conclusions are formed from practical experience obtained by the writer at a number of cement factories, and are not expected to coincide as a whole with those findings of other investigators, but are given for what they may be worth to the reader.

Heavily Reinforced Concrete Water-Cooling Towers Have Cooling Capacity of 3,000,000 Gallons

Thin-Walled and Heavily Reinforced Towers Permit Free Circulation of Air—Concrete Used Has High Conductivity—Tanks Built Have Cooling Capacity of Nearly 3,000,000 Gallons Per Hour

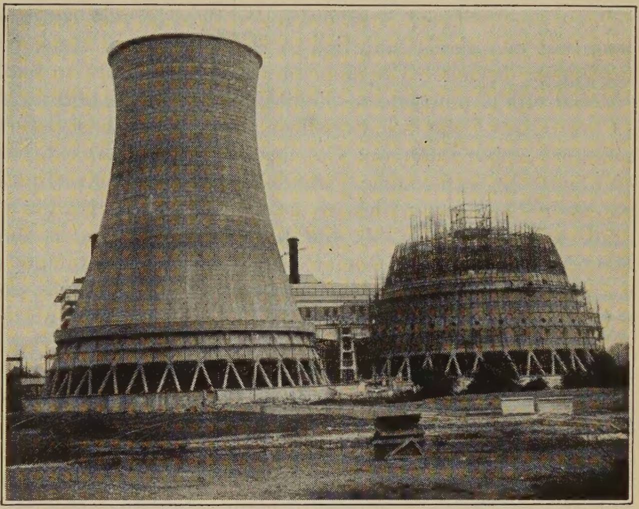
By A. C. BLACKALL

A problem of very considerable importance in connection with large-capacity power stations is that of insuring an adequate supply of cooling water; and when, as is frequently the case, the location of the station does not allow of the use of a natural source of cool water, provision must be made for cooling the same body of water artificially, for recirculation over and over again. When the amount of water to be dealt with reaches several million gallons per hour the cooling plant becomes a very important unit in the functioning of the station.

In a recent lecture before the Institution of Structural Engineers in Yorkshire, A. T. J. Gueritte described the main features of the design and construction of the latest type of reinforced concrete cooling towers. With a unit capacity up to 5,000,000 gallons per hour, they are in shape hyperboloids of monolithic construction. In their largest size they may attain a base diameter of some 180 ft., with a height of about 220 ft. Their concrete walls are but 5 or 6 in. thick, the reinforcing bars running diagonally along the directions of the generating line of the hyperboloid. From the largest diameter at the base they narrow to a minimum diameter at the throat at about three-fourths of the height and then open in bell-mouth fashion to an increased diameter at the top. This shape causes a reduction of air velocity before exit from the tower, with consequent precipitation inside the tower of much of the suspended water.

The concrete used is the outcome of special experiments and is selected for its strength, density and high conductivity.

The hyperboloidal shell is supported on reinforced concrete stanchions which, like the shell reinforcement, also lie in the diagonal directions of the generating line, thus giving the impression that the shell is standing with its base resting on a ring of alternate inverted and upright v's. This openwork construction gives very free access to the cooling air on all sides. To reduce air resistance and the formation of dead air pockets to the minimum the encasing concrete of the stanchions is oval in section and the base ring of the shell is radiused. The cool water pond below the tower is a reinforced concrete saucer the upcurved rim of which takes the outwardly inclined thrust of the stanchions supporting the shell. No heavy foundation work is required, for the pond wall distributes the thrust at a reasonably low intensity over the ground.



The hot circulating water is delivered at a level of 25 or 30 ft. up the tower through a central rising main in the smaller designs and to an external annular duct in the larger designs. Radial wooden troughing distributes the water over the whole of the internal area of the tower, from which it drips on to baffles, also of timber construction. Various alternative systems of scaffolding and shuttering have been devised to meet various circumstances of construction, some internal to the shell and some external, some of steelwork and others of lumber.

Missouri Portland Selects Site; Get Oklahoma Plant Under Way

Plans and specifications for a cement manufacturing plant to be built near Tulsa, Oklahoma, by the Missouri Portland Cement Co., have been completed and construction was expected to have gotten under way during August. The site selected is one-quarter mile north of the McIntyre airport.

The company will be incorporated under the laws of Oklahoma and will use a name different from that of the holding company.

New British Cement Combine Fails to Make Good Showing

By A. C. BLACKALL

The great new British cement combine known as Allied Cement Manufacturers, Ltd., which, as a result of a merger effected last year, controls the producing elements in the Red Triangle group of companies, has had an unsatisfactory result for its first year's operations. Its accounts for the year to March 31 are, due to the merger, not comparable with those of the constituent companies for the preceding year.

They provide unsatisfactory reading for the stockholders, for after paying the preferred stock dividend, writing off the expenses of the merger ($303,670) and appropriating $125,000 for depreciation, the balance remaining at revenue account is approximately $51,545, which is carried forward. There is an unfunded debt largely resulting from the combine's inability to issue preferred stock following the fusion. The sum due on loan account to bankers and others amounts to $3,395,545, but $940,000 owing at the date of the balance-sheet for the purchase of the British Standard Cement Co. has since been repaid. Investments in subsidiaries stand at $10,867,750. Investments in listed securities of associated companies have a book value of $725,280, but their market value is only $212,500, while the associated companies' investments in unquoted shares is $2,741,495. In other companies it possesses $542,340 of quoted investments, of which the market value is $116,400. The companies' investment reserve of $985,245 has been utilized in writing down the book value of the investments from $14,903,145, their cost value, to $13,917,900.

During the current year, the report states, the cement works controlled by the company have increased their output and properties, and the directors state that they have been able to effect numerous economies.

The World's Deposits of Bauxite

For many years France has been considered as holding a monopoly on bauxite, the crude ore from which aluminum is obtained. But now the ore is mined in Georgia, in Alaska, etc. Furthermore, deposits exist in Jugoslavia.

The three Guianas (British, Dutch and French) contain deposits of bauxite which have been operated since 1917 and 1922, as far as British and Dutch Guiana are concerned. The deposits in French Guiana, on the other hand, have not as yet been exploited.

In West Africa some deposits have been re-opened, notably in the English Gold Coast region, which are estimated at 180,000,000 tons, at times yielding small amounts of gold and silver; and likewise in French Guinea and in Sierra Leone. Deposits are also found in South Africa, in Nyassaland, in Rhodesia and in Mozambique. In Morocco there is a deposit of 20,000,000 tons in the Grand Atlas.—S. C., in *Revue des Materiaux de Construction*, April, 1930.

French Firms Show Profits

The French cement firm, Societe des Ciments Francais et des Portlands de Boulogne-sur-Mer et Compagnie des Portland de Desvres, reports a net profit of 15,439,315 francs for the year and has declared a dividend of 250 francs per share.

Chaux et Ciments de Lafarge et du Teil report net profits of 11,762,712 francs for the past year and dividends of 56.50 francs per share.

The Compagnie Internationale des Ciments (Intercine) reports profits for the past year at 11,255,007 francs and dividend of 105 francs per share.

Ciments Portland Artificiels d'Origny-Sainte-Benoite, of Lille, report net profits of 7,038,959 francs for the past year and declare a dividend of 175 francs per share.

Compagnie Nouvelle des Ciments Portland du Boulonnais announces net profits of 2,074,185 francs for past year and dividends of 45 francs per share. Capital increased from 20,000,000 to 30,000,000 francs.

Chaux et Ciments Portland du Haut-Rhin, at Mulhouse, declares dividend of 10 per cent instead of preceding one of 6 per cent. Capital increased from 16,100,000 to 20,000,000 francs.

Societe Coloniale des Chaux et Ciments Portland de Marseille reports profits for past year at 4,194,199 francs with a dividend of 60 francs per share.

Trophy Dedication Exercises at Plants Continue

Three ceremonies in which Portland Cement Association trophy awards for 1929 accident-free records were dedicated were those at the Kingsport, Tenn., mill of the Pennsylvania-Dixie Cement Corporation, at Mill No. 3 of the Vulcanite Company at Vulcanite, New Jersey, and at the Great Lakes Corporation plant at Buffalo, N. Y.

F. Guenther, Jr., presided at the Tennessee meeting, held July 31st, and accepted the trophy in behalf of the plant. Opening remarks were made by W. H. Klein, general manager, and President Blaine S. Smith delivered an address. The trophy was presented by A. J. R. Curtis.

The Vulcanite meeting was called to order by S. H. Harrison. Presentation of the award was by J. B. John, and Cleveland M. Rhen, member of the plant safety committee, acknowledged it. W. D. Lober, president of the company delivered an address, as did also A. J. R. Curtis, assistant to the general manager of the association.

The Great Lakes dedication took place on July 23rd and was part of a program including picnic and field day activities at a local stadium. Adam L. Beck, president of the Great Lakes Corporation, presided. The trophy was presented by A. J. R. Curtis and accepted by J. B. Zook, chief engineer of the corporation. Lt. Col. H. A. Reninger was the speaker of the day.

Palestine Cement Industry Developing

A very satisfactory advance was made by the portland cement undertaking (Nesher) of Palestine last year. Cement is one of the most promising of Palestine's new industries, the output last year amounting to approximately 70,000 tons, most of which was consumed locally. The company has found substantial markets for cement in the neighboring countries of Syria and Transjordania, and it is now in a position to cater to the markets of the Near East generally.

Lower Imports of Cement in Finland

Cement imported to Finland in 1929 from all sources amounted to 29,969 tons. This was less than half of that imported in 1928. During 1925 to 1928, the imports had grown from 15,058 tons to 78,238 tons. This increase was due to a boom in the Finnish building trade. The cement plants of the country were not able to satisfy the demand. The large quantities of imported cement from 1926 to 1928 will have to be regarded as an exceptional occurrence, and future imports, as far as can be foreseen, will be lower than the 1929 figures.

Bulk Cement Shipped in Special Containers

Used Extensively for Shipping Bulk Lime — Several Months' Trial Demonstrates Practical Value in Shipping Bulk Cement—50-Barrel Containers Now Supplied as Railroad Equipment — Might Be Owned Outright by Manufacturer—How Shipments Are Handled

Experiments recently made with several cement companies have demonstrated the practical value of transporting bulk cement by the method here described. The possibility of shipping bulk cement in this convenient form is of special interest in cases where shipment is made direct from the mill to the user, such as ready-mixed concrete and concrete products plants, and the larger construction projects. The further possibility of shipping bulk cement in lots as small as 50 barrels is in itself something worth thinking about.

This method of shipment is used extensively in certain sections in the East for shipping brick and bulk lime. Its extension to the shipment of cement appears to be a natural development.—The Editors.

THE use of special containers for handling and shipping bulk cement by railway freight was tried out on an experimental basis in the East some months ago. The experiments demonstrated the merits of this method of transportation. In consequence, the containers have since been used to a considerable extent for shipping bulk cement in certain sections in the East where their use in shipping brick and lime has become more or less familiar in building material circles. The containers employed in handling cement are identical with those designed for lime.

Development of Containers

The development of these containers for bulk shipment of lime and cement is a direct outgrowth of the use of similar containers in railway shipments of brick, which in turn were developed from a much larger container used in handling and transporting l.c.l. shipments of merchandise. The brick containers have been used to an increasing extent for five or six years. They are of the same size and weight as those for lime and cement, the main difference being that the lime and cement containers have a waterproof top, and certain improvements were made in the bottom-drop doors to make them leakproof.

Arrangements Covering Use of Containers

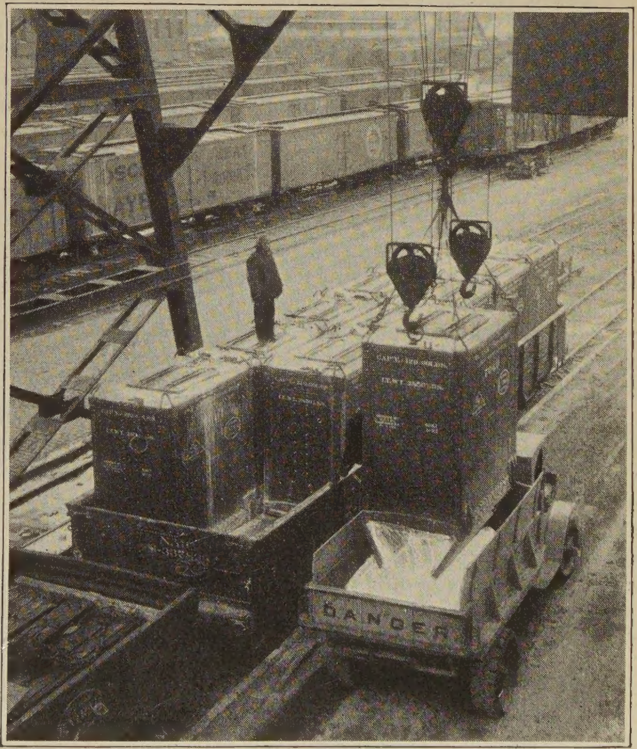
A number of these containers have been manufactured by the Merchants' Despatch Transportation Co., of East Rochester, N. Y., for use on the New York Central Railroad. Under the present method of operation the containers and the 70-ton gondola cars on which they are transported are essentially railroad equipment and are supplied to shippers in the usual way, when needed, the same as a box car or any other piece of railroad equipment. There are no previous contractual obligations in the way of selling the containers outright to cement plants, or making arrangements whereby the containers can be used by the manufacturer on a mileage basis or some other basis, just as some large concerns operate their own private railway freight cars. Up to the present time no such arrangements have been concluded.

The patents covering these containers are owned and controlled by The L. C. L. Corporation, of New York.

Description, Size and Weight

The containers used in shipping lime and cement in bulk are identical. The top is made impervious to water, to prevent damage to the contents in transit. The bottom is fitted with a pair of leakproof drop-bottom doors, which are opened and closed by a special device. Lifting brackets are provided at the upper corners.

The possibilities of these containers for the bulk ship-



The cement containers are identical with these lime containers. The bulk material is dumped into trucks and the empty containers are returned to the gondola car ment of cement can be visualized to the best advantage after a study of their size, weight and capacity, and the capacity of the gondola cars employed to transport them. The size and weight of a container are given in the following tabulation:

Inside dimensions:	
Width	4 ft. 1 in.
Height	7 ft. 4¾ in.
Length	6 ft. 11¼ in.
Outside dimensions:	
Width over guides	4 ft. 8¾ in.
Height over lifting brackets	8 ft. 4 in.
Length	7 ft. 2½ in.
Capacity	209 cu. ft.
Weight (empty)	2,300 lb.

The car used by the N. Y. Central R. R. for transporting the containers is a low sided gondola car with space for 12 containers, as shown in the illustration. As previously stated, the capacity of this car is 70 tons. After adding the 10 per cent overload permitted, the maximum carrying capacity is 154,000 lb., just enough to take 12 containers filled with bulk lime.

The greater weight of cement, however, will prevent the carrying of so many to a carload. Considering a single container, its capacity of 209 cu. ft. permits it to hold 52 bbl. of cement. Probably the more convenient quantity of 50 bbl., weighing about 18,800 lb., will be established as the capacity of a container. This brings the gross weight of a container and 50 bbl. of cement to about 21,100 lb.

Twelve full containers, therefore, each holding 50 bbl. of cement, would have a total gross weight of 253,200 lb., or about 100,000 lb. more than the allowable load on the 70-ton gondola.

Number of Containers to Carload

There is considerable variation in the size and capacity of gondola cars operated by the various railroads; but so far as the 70-ton car used by the N. Y. Central R. R. is concerned, seven containers each holding 50 bbl. of cement, and weighing 147,700 lb., would constitute the limit.

A matter of still greater importance to shippers of cement is the question as to the *least* number of containers that would constitute a carload (and obtain the carload freight rate). The minimum carload is another variable element in different territories; but in the midwestern territory the minimum shipment of portland cement that gets the carload freight rate is 50,000 lb. This means that three containers, each holding 50 barrels and weighing 63,300 lb., will be entitled to the carload rate.

From the foregoing figures it will be seen that any cement shipment of three or more containers will be carried at carload rates, the upper limit quite obviously depending on the carrying capacity of the largest gondolas available. In all probability the development of this method of shipping cement will be accompanied by the construction of gondolas having the dimensions and capacity necessary to carry the containers to the best advantage.

Bulk Cement in 50-Barrel Shipments

An interesting point in the foregoing figures may be seen in the fact that bulk shipments in 50-barrel lots will be possible. While a shipment of either one or two containers would be charged the l. c. l. freight rates, consideration might well be given to the possibilities involved in 50-bbl. shipments in this convenient bulk form.

How Bulk Cement Is Handled

The general practice with the original l.c.l. containers for shipping merchandise is to truck the containers themselves to the place of storage or consumption. With the bulk-freight containers this practice is not necessary. Materials such as brick, lime and cement are dumped through the drop-bottom into a truck alongside the car, and hauled to their destination, the emptied container being returned immediately to its place on the car. In the case of ready-mixed concrete plants, concrete products plants, building material yards and similar installations that are located on railway sidings and are equipped to receive and handle bulk cement, the containers are dumped directly into the receiving hopper. The same may be done on an individual construction project that has its concrete mixing plant near a railway siding, provided the plant is equipped to receive and handle cement in bulk.

An overhead gantry crane, a caterpillar crane or any other handling equipment capable of lifting 10½ tons may be employed to lift and dump a container holding 50 bbl. of cement. In the process of dumping, the container is lowered to within a foot of the truck bed or hopper bottom, the drop-bottom doors are opened and the container is gently lifted. This permits the material to flow out without impact and without creating an undue amount of dust.

Economies Effected

The economies effected through the use of these bulk-cement containers are quite obvious. First, there is the matter of time. In the case of a carload shipment, so much time is saved in loading at the mill and unloading at the point of destination that a gondola car will be released several days sooner than where ordinary loading and unloading methods are employed. Second, an even greater advantage is realized in the saving of human labor, for here is another instance where drudgery is eliminated and efficient mechanical equipment takes its place.

Bessemer Semi-Annual Report

The Bessemer Limestone & Cement Co., for the six months ended June 30th, reports net earnings equivalent to 2.81 times interest charges on first mortgage bonds. Net, after federal taxes, was $114,321 or $2.28 a share on Class A stock.

Six months' dividends on Class A stock total $1.50 a share.

Dust Collectors for Buffington Plant

Installation of a $1,000,000 dust collecting system at its Buffington, Indiana, plant is planned shortly by the Universal Atlas Cement Company. The work is expected to be completed in the spring.

International Earnings Fair

Earnings of the International Cement Corporation for the first six months of the current year are reported as eminently satisfactory in view of the business situation. Net income amounted to $2,051,762, equivalent to $3.25 a share, as compared with net of $2,167,408 or $3.50 a share, for the like period of 1929.

Illinois Medusa Plant Closes

Its first shutdown since beginning operation was put into effect at the Medusa Portland Cement Company plant near Dixon, Illinois, on August 9th. It is hoped to reopen September 1st.

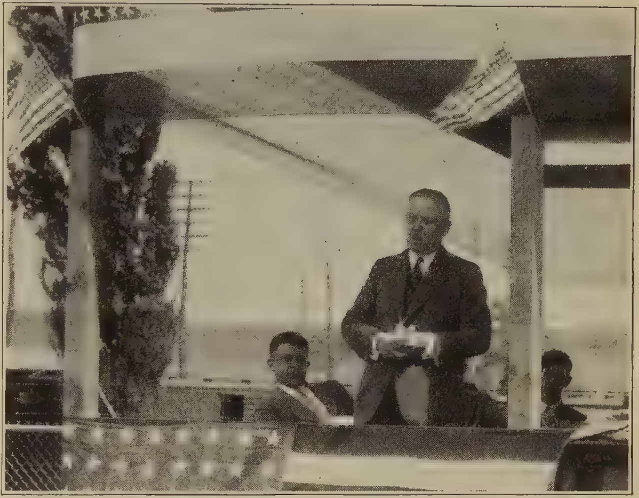
Safety Mark for World Set by Cement Industry

A Leader Tells of Conditions Before Concentrated Movement and How Improvement Was Initiated—Importance of Safety Organizations to Plant Relations—Value of Regional Meetings

By J. B. JOHN
President, Medusa and Petoskey Portland Cement Companies; Chairman, Committee on Accident Prevention, Portland Cement Association

AMERICAN industry is emerging from a period in which it overvalued the machine and undervalued the man. Mechanical improvement during the last half century has startled the world; only recently have we come to the realization that improvement and protection of the human equipment has not kept pace with machine improvement. So there is a growing belief that further progress must be based to a very considerable extent on the improvement and the better protection of operating men.

Experience among the cement mills has been little different from that in other lines which make up industry as a whole. Consequently, our foremost manufacturing problem, as many of us now see it, is to build up men as fast as we improve methods and equipment—and as much faster as we can. The promotion of that idea is one of the projects being carried forward by the Committee on Accident Prevention and Insurance of the Portland Cement Association.



J. B. John, addressing a safety meeting of his mill employees at the York, Pa., plant of the Medusa Portland Cement Co. At Mr. John's right on the platform is W. L. White, Jr., general superintendent. That executive interest brings results is shown by the fact that seven of the eight Medusa plants have operated without accidents so far this year

What We Expect of Our Employees

Successful operating men require a high sense of responsibility toward the company and fellow employees; a viewpoint broader than is usually developed within the

Scene at the trophy dedication of the Great Lakes Portland Cement Co., at Buffalo, N. Y.

scope of their mill work alone; a spirit of fair play; a growing knowledge regarding the management and handling of men, and a never-failing enthusiasm for their work. All of this should be based on the sound conviction that the employer is absolutely fair and as liberal as his circumstances will permit, and that no other job offers greater possibilities for advancement. These are fundamental conceptions with which I hope there is no disagreement.

Some one may ask, "Aren't some of these ideas considerably broader than the scope of a campaign to reduce industrial accidents?" No, they are not. Our committee, in administering its safety work among the cement mills of America, has found that no other activity around a mill or quarry stresses the human values as greatly or develops a sense of mutual responsibility so quickly. The work of our committee has broadened the viewpoint of our men tremendously. It is providing them with exact operating knowledge of a kind which saves men, time and dollars. As a means of cultivating enthusiasm for their work and pride in their mills and of projecting these contagious qualities out into the community and making these mills respected and appreciated, I don't know of anything to equal it. Our accident prevention work is not only greatly reducing the sorrow, suffering, poverty and despair which attach to industrial accidents, but it is actually substituting for them operating efficiency, public good will, fairer and more rapid advancement for competent and deserving men, financial prosperity, contentment and health to the individual, and a comradeship among men which stimulates output and demonstrates to every man what a blessing he can find in his daily work.

Over 700 white persons sat down at a feast at the Birmingham plant of the Lehigh company; 200 colored people duplicated this event in an adjacent building

Cement Mills Lead in Accident Reduction

The cement factories of America have given the industrial world an example of progress in the elimination of injuries to workmen which, so far as I know, has not been excelled. Six years ago 105 mills reported to the Portland Cement Association a total of about 3200 accidents involving loss of time, permanent disabilities or death. Last year this group, augmented to 138 manufacturing units, suffered only 723 accidents of all classes. Annual fatal accident figures dropped from 61 to 37 during this period. At the beginning of this period the monthly accident rate frequently exceeded 30 accidents per million barrels of cement produced; last year there was one month during which the rate was around 2 accidents per million barrels and the year's average was only a fraction above 4 accidents per million barrels.

During the period referred to, at least 33 new plants were added to the statistical record, and more than that number were overhauled and equipped with additional or new and larger machinery. Hundreds of inexperienced men were hired. Notwithstanding these circumstances, the accident totals dropped off precipitately.

While new and better designed machinery and safer installation played their parts in the splendid reduction of accidents, the credit must go primarily to the safety movement within our industry. Let me cite a few examples.

The oldest cement plant west of the Mississippi river received the first Association trophy in 1923 for a year's operation with by far the lowest accident record up to that time.

In 1929 one of the oldest mills in the United States, at Ormrod, Pa., operated without lost time or other serious accident.

The oldest mill in the Kansas district, located at Iola, has had no recordable accidents for over three years.

The Cowell mill, in Contra Costa County, California, one of the pioneers of that region, completed four years without accident on May 11, 1930.

Now, to show that modern design and installation do not of themselves insure safety to employees, note the following:

A new plant was completed in 1925, modern in every respect, with every recognized safety device and progressive management. During 1926 it suffered four fatal accidents.

A new plant developed in 1927 to be a model as regards cleanliness, operating efficiency and safety of workmen, suffered four fatal accidents in 1928.

A plant completely rebuilt and re-equipped a few years ago, but operated with tried and experienced personnel, suffered 86 serious accidents the following year. (This plant has since reduced accidents to a very nominal number.)

The first aid team of the North American Cement Corporation plant at Security, Maryland, one of the hundred or more now organized throughout the country

How Is It Done?

Of course the mere statement of our improvement is not so interesting or nearly so informative as a few facts concerning the methods employed in accomplishing these results.

We started out to sell the idea that accidents are unnecessary and to obtain the active help of every man connected in any way with cement plant operation. From the cement company executives, without a single exception, signed pledge of co-operation with our committee was secured. From all of the operating executives, we secured promises to promote the work throughout their organizations, while the plant superintendents agreed in writing to do their part with the local forces at each mill and quarry.

Foremen and department heads promised to conduct faithful inspection of their department premises, equipment and personnel and to carry on instruction of their men in safety principles. Workmen promised to protect themselves carefully and to avoid injury to those around them, signing pledge cards.

Our committee has carefully renewed these promises, once a year. All of them are made in writing as an evidence of good faith, which makes us feel certain that 100 per cent of the men of all classes are behind us. With this preparation it is not surprising that in June, our month of special effort, accident records continue to hit new low levels.

There are employed in the cement mills and quarries an estimated 40,000 men. There are some 2,500 department heads and foremen. Our committee has arranged for some fourteen or fifteen regional safety meetings each year, all of them within easy traveling distance of most of the mills. These have a combined attendance of slightly under 2,000 mill men, or about one man to every twenty employed. Attendance at these meetings includes executives, operating managers, superintendents, foremen and a certain number of workmen picked for faithful service or conspicuous progress. All are key men.

These meetings do much to broaden viewpoints, provide information and recharge enthusiasm. Committees of mill men divide the duties of managing the meetings and the committee personnel is seldom the same for successive meetings. Outside talent is used sparingly on the programs, most of the papers being written and read by mill men themselves. The educational value to the men who prepare these papers is noteworthy. It is expected that a total of nearly 150 such papers will have been prepared by mill men this year.

"First Aid and Fox Trot"

With less than a half dozen exceptions, all cement mills in association membership now have first aid teams and twenty or more have trained one hundred per cent of their employees. Three years ago there were probably less than a score of active teams. Today there are several hundred. Many competitions between first aid teams are being arranged as a means of keeping up interest and technique. In many places the mill safety committees are "starring" their teams before commercial and civic club and school audiences, and not infrequently they compete at community social gatherings. The committee representing the Yosemite Portland Cement Corporation's teams recently conducted a contest and dancing party at Merced which was uniquely advertised as "First Aid and Fox Trot." The affair gained so much publicity that the Yosemite team simply had to win, and it did.

It is almost impossible to over-estimate the advantages to operation resulting from a well-organized and carefully conducted safety organization in the mill or quarry. It easily becomes the vehicle through which safety and most other personnel problems can be solved. The meetings may be made highly educational. The well-rounded committee not only investigates and studies accidents and their elimination, but it fights waste of every kind, studies men and helps find those capable of advancement, attends to the relief of sick and needy, reduces unnecessary absenteeism, promotes good will for the plant in the community, assumes its share of every community responsibility and provides social and entertainment features which are often entirely lacking from other sources.

Perfect Records Create Many Benefits

Since 1923, 47 cement plants have completed one calendar year or more without lost time or more serious accidents. Their records represent a total of sixty-two calendar years of safe operation. More than forty per cent of the association awards made to date were for accident-free operation during 1929.

Colored workers preparing the "Brunswick stew" for the Spocari barbecue

All of the plant organizations to achieve the distinction of being awarded the association safety trophy have planned and conducted their safety work with the utmost thoroughness. The greater number have won only after several years of concentration on this objective. That no other factor counts nearly so much as well-organized and concentrated effort is quite evident from the large number which were able to win in 1929. The training received in a campaign of several years' duration is of a very sub-

At Spocari, Ala., the whole countryside joined with the cement plant in a barbecue meal in a grove on company property. Twenty-five pigs and 15 lambs were prepared over open fires stantial sort and its effects should persist far into the future, even if further efforts were not made. Obviously, the direct benefits are more than sufficient in themselves to justify the cost of the handsome cast stone trophies given by the Portland Cement Association and the cost of sending mill delegates to New York each year to receive the formal award.

The after-benefits of winning the trophy are often nearly as valuable as the more direct ones referred to above. After a mill has attained an accident-free year, safety is kept in the limelight by a succession of interesting events. The plant assumes a position from which it cannot drop without loss of prestige. Two delegates are chosen to represent the mill organization at the meeting of the association. They are given a trip to New York; on their return they make a complete and interesting report to the mill force, usually in mass meeting. The site for the trophy is then selected and a foundation placed. The trophy is received and is erected, a copper box containing historic documents being placed in a core provided within the stone.

Of course these trophies must all be dedicated and unveiled with appropriate ceremony. There are the formal exercises, with invocation, presentation, unveiling, acceptance, an oration and the benediction. There are words of congratulation and good cheer from friends in the community and in the industry at large. Prominent persons are happy to pay homage to a noble achievement by workingmen. The employees and their families, and sometimes people of the surrounding community or countryside, sit down together at a dinner or a supper in picnic or barbecue style. The day is often finished up with a program of games, races, contests and entertainment.

Community interest in cement plants and in safety is stimulated by these occasions and the records upon which they are based do much to give cement leadership in safety, as in other important fields. Best of all, however, is the outstanding accomplishment of having made injury to fellow workers intolerable among our workmen. We are all proud of our employees and associates in the mills and quarries who have reached the point where they will not countenance accidents to their fellows. It is principally their spirit and effort that keep lifting our safety work to new heights of achievement.

Protective Clothing and Devices Are Aids to Safety

Management Should Take Interest in Workmen's Clothing—Goggles Necessary in All Departments—Special Hats and Shoes Required—Keep Neckties and Loose Sleeves Out of Machine Shops

By E. F. ALDERTON

Superintendent North American Cement Corporation, Martinsburg, W. Va.

While we can hardly classify goggles as clothing they are, nevertheless, one of the most important items of safety wear in our industry. Some companies make it compulsory that every man on the job have a pair of goggles and wear them when needed. Our company strictly enforces this rule.

Shoes that Prevent Injuries

In years gone by we experienced many accidents to the feet. After careful investigation we found a shoe with a safe toe which we offered to the men at cost, cheaper than the average shoe which the workmen had been buying. These shoes have been the means of preventing several bad accidents in our plants during the short period we have been using them. They are especially adapted to the needs of men who handle material and where there is danger of stones or other objects falling or rolling on the feet.

Some of the companies experience mud ring trouble in their kilns, and in this connection a considerable number of men have received bad burns from going into the kilns without proper clothing. This is especially true when a man wears a pair of shoes half tied up or with holes in the soles. A pair of asbestos leggings and a good tight pair of shoes well laced will prevent accidents in situations of this kind.

How Accidents Occur in Machine Shops

The man on the lathe or shaper should not be allowed to wear a necktie and his clothing should not be ragged or have loose sleeves. Many accidents in our industry can be traced directly to the men being permitted to wear overalls with long cuffs turned up outside. We have a rule that these overalls shall either be cut off or turned up on the inside. Rubber gloves prevent accidents and should be worn when needed.

Safety belts are very useful in our industry and should be worn in several departments. In the crusher department, especially when the crusher chokes up, a man hooking stone with a long hook is liable to fall into the crusher if not protected with a safety belt.

Many accidents to the head would have been prevented by supplying the workmen in certain departments with "hard boiled" hats. These are not very comfortable at first, but the workmen soon get used to them. These hats should be worn particularly around the quarry or in any other departments where there is danger of falling material.

There is an old saying that a healthy man is a safe worker; therefore let us see that the workmen wear healthful as well as safe clothing.

Paper read at regional safety meeting of the Portland Cement Association at Washington, D. C., June 26th.

Effective Safety Meetings Subject of Report

The Policyholders Service Bureau of the Metropolitan Life Insurance Company has just issued a report entitled *Safety Meetings*, as the eighth in a series of reports based upon a study of the field of safety engineering. The principles governing successful accident prevention work as well as tested methods of applying them are presented. The value of mass, rather than individual, appeal, is pointed out particularly.

The publication discusses the types of meetings which have been found most effective, together with suggestions for making them interesting. A chart shows how the value of safety activities can be measured in terms of decreased accident rates. Copies are available to industrial executives, upon request to the bureau at One Madison Avenue, New York City.

New Belgian Sales Organization Formed

A 25,000,000 francs sales and exportation corporation, the C. B. R. Exportation, has been formed by a group of Belgian cement interests including the following firms: Auxiliaire des Ciments, Cimenteries et Briqueteries Reunies, Ciments d'Obourg, Ciments de Vise, Ciments Meuse-Brabant, Ciments de Cronfestu, Ciments de Lanaye and the Ciments Portland Liegeois.

~ EDITORIAL ~

Seeing Five Years Ahead

MANY large corporations are keeping their eyes so closely riveted to the profit and loss accounts that they are moved to do things that in a year from now will seem foolish.

One organization "cuts down expenses" by cutting out all advertising and discharging half the sales force. That move may have the immediate effect of showing a profit on the books, but it is the kind of "profit" for which, later on, the company may pay a high price. Next year the effect of continuity in advertising will have been lost. Sales contacts will have been lost, many of them having passed into the hands of competitors. Much of the ground cultivated in previous years will have to be cultivated over again.

In the cement industry the problem of individual manufacturers is not only that of holding the advantages gained, but also that of keeping up with the procession that is moving forward.

The question of high-early-strength cement is a case in point, for this product has received a great impetus as a result of the adoption of the A. S. T. M. standard specification for such cement. More and more is heard about high-early-strength cement and other special cements among architects and engineers who supply plans and specifications for large buildings and large engineering projects. They see the advantages of early strength for certain locations or certain kinds of service. These special cements have become quite the favorite among highway engineers for closing unpaved gaps on fills, and for repair work. They have been used exclusively in concrete road work in mountainous sections where detours are long and tortuous. They are going into bridge piers and abutments. The prediction can be made, with as much certainty as the future can be predicted, that the annual consumption of high-early-strength and other special cements will be on the increase for some years to come, until their logical uses are rather fully developed.

Manufacturers not now equipped to make high-early-strength cement may hesitate to make the installation changes and improvements necessary to its production. Admittedly, courage will be required to do so in this year of difficult profits; but the manufacturer who allows his judgment to be controlled by the question of immediate profits may later find himself in a sorry plight in comparison with his competitor who, in 1930, was able to see five years ahead.

The very same may be said about the installation of equipment designed to reduce grinding costs, or to recover waste heat, or to save fuel, or to accomplish any other worthwhile step in the direction of improving quality or reducing production costs. Plants that simplify shipping and handling problems will likewise have the advantage over those that ride along contentedly with present methods.

Most of these advances in production and shipment will require new or improved equipment. The manufacturer who is in the habit of looking ahead five years will find some way to finance necessary installations now.

Cement Colors Or Colored Cement

A DEFINITE interest in colored concrete has developed in this country, both in monolithic concrete and in building units. This development has been in progress for some years, and has taken quite positive form in recent times.

The desire to combine color with form in the architectural treatment of concrete is back of this interest in color. The life supplied by color is to replace the more lifeless gray surfaces of ordinary concrete.

One important question remains to be solved, by the manufacturer of cement. That question is whether colored concrete shall be made with cement colors or with colored cement—whether the contractor or the products manufacturer shall buy his colors separately and mix them with the concrete, or whether the colors shall be mechanically mixed with the cement at the mill and the mixture sold as colored cement.

Authorities seem to be united in the opinion that more satisfactory results are obtained if the colors are intimately mixed with the cement than if added to the concrete in the products plant or on each individual construction job. Aside from white cement, however, little effort has been made in this country toward the marketing of colored cement. In this respect Europe is far ahead of us.

The production of colored cement at the mill does not mean a separate manufacturing process. There is no actual chemical combination between the cement and the coloring matter. It is a mechanical mixture, obtained by regrinding the regular gray or white cement with the colors in an auxiliary ball mill, thereby obtaining a much more intimate mixture than is possible when the colors are added at the time of making the concrete.

The cement industry seems definitely committed to the production of special cements. Here is an opportunity for a manufacturer to enter a special field in which but little extra equipment will be required. The demand is partly developed. The marketing possibilities are well worth careful investigation and study.

Self-Unloading Cement Carrying Vessel for Canadian Concern

Diesel-Electric Propelling Machinery Installed—Cargo Carried in Holds of Hopper Form—Cement Pumped Ashore by Well-Known Electrically Driven System—3,150-Ton Vessel Designed for Service on Great Lakes, St. Lawrence, and Atlantic Coast

By A. C. BLACKALL

ONE of the most novel and interesting vessels yet constructed for the bulk handling of cargoes is the "Cementkarrier," recently completed by the Furness Shipbuilding Co., Ltd., Haverton Hill-on-Tees, England, for the Canada Cement Transport Co., of Montreal. The particular features of interest center in the electric cement pump discharge gear and the diesel-electric propelling machinery. In these respects the "Cementkarrier" is the first electrical self-discharging vessel ever constructed in the United Kingdom, and it comprises an interesting addition to the rapidly increasing number of special bulk-carrying and self-discharging vessels constructed by the builders. The "Cementkarrier" is the eighth vessel recently constructed in Britain for the carriage and rapid discharge of bulk cargoes, and constitutes a unique departure from the "Bulkarrier," constructed last year by the builders for the same owners, the Canada Cement Transport Co., Ltd., of Montreal.

For Great Lakes, St. Lawrence and Coast Trade

The "Cementkarrier," as stated, is the pioneer self-discharging vessel constructed in the United Kingdom with diesel-electric propelling machinery and electric cement pump discharging gear. She is constructed to conform to the limiting conditions imposed for transit through the Canadian canal locks and to suit the special requirements of the owners' service on the Great Lakes, the St. Lawrence, and for the coast trade. She is arranged to obtain under special survey the highest class of the British Corporation and to meet the Canadian government steamboat inspection regulations.

The principal dimensions are: Length, 258 feet; beam

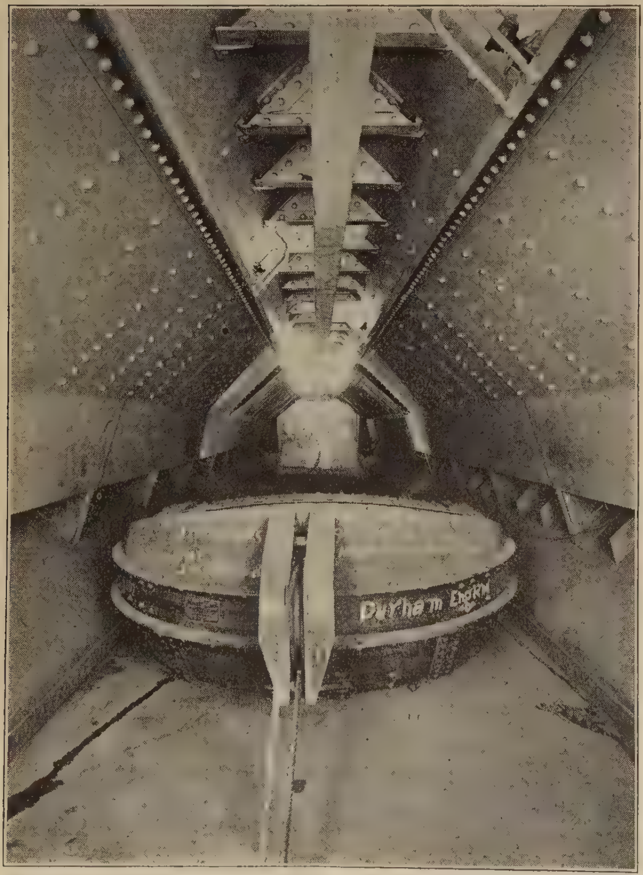


Figure 1. Scrapers dragged along tunnels discharge cement into hopper bunkers (looking forward)

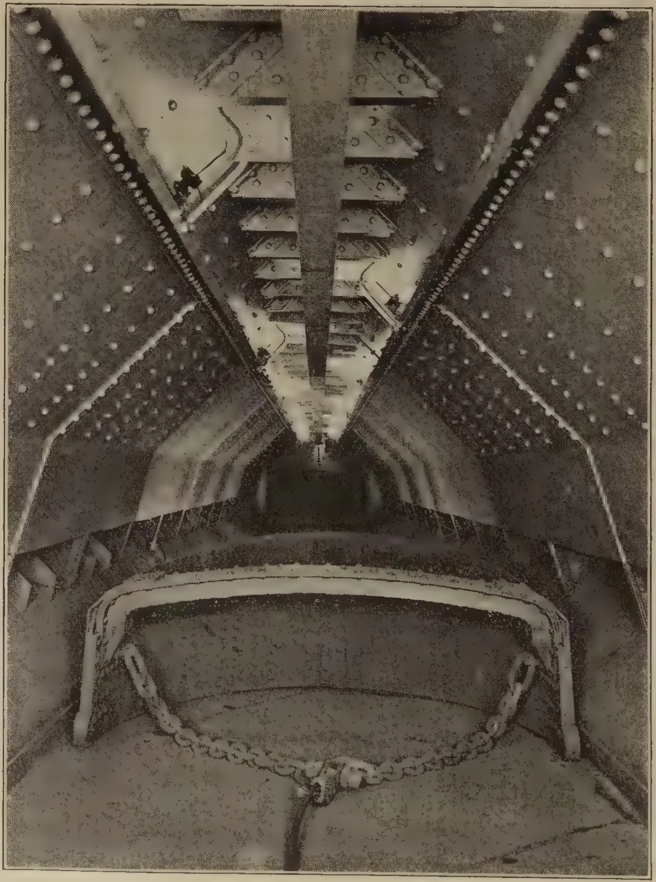


Figure 2. Scraper shown in Figure 1 (looking in opposite direction).

43 feet 2 inches; depth (molded), 20 feet. A total deadweight of about 3,150 tons will be carried on the load draft.

The cement cargo is delivered into the holds by means of shore pipes led into small watertight steel access hatches fitted on the trunk top into three self-trimming holds of hopper formation, each divided by steel center line bulkheads into two compartments, arranged to deliver cargo into two fore and aft scraper tunnels.

The discharging gear consists essentially of a Sauerman

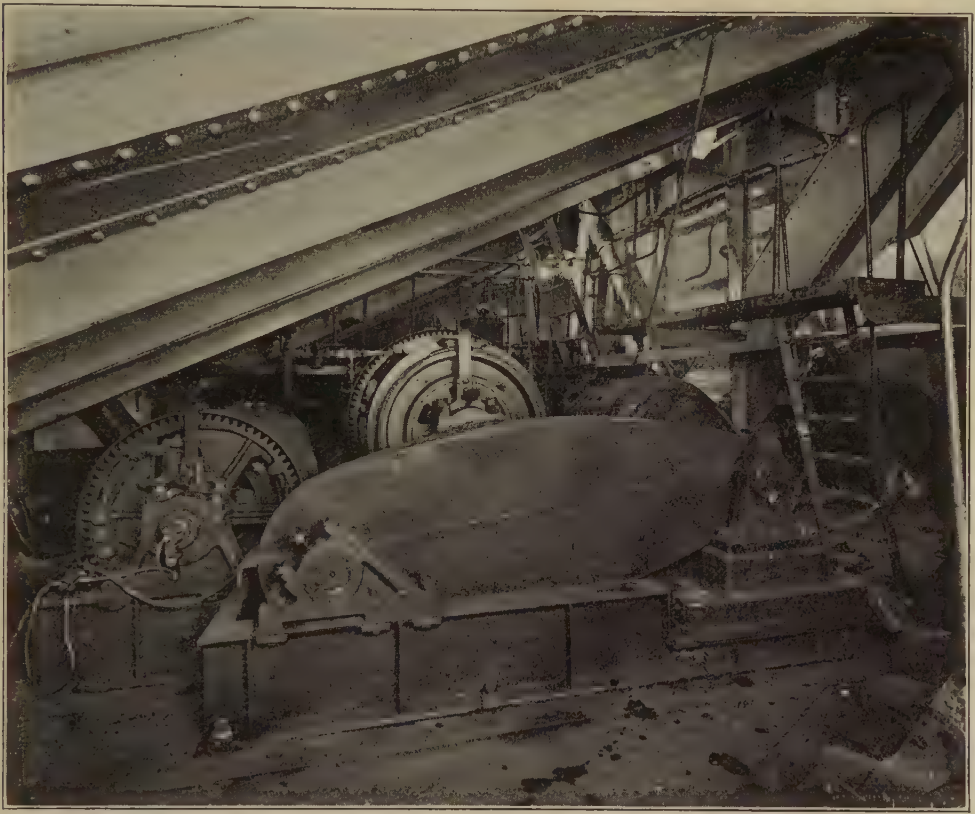


Figure 3. Equipment for hauling cement scrapers shown in Figures 1 and 2

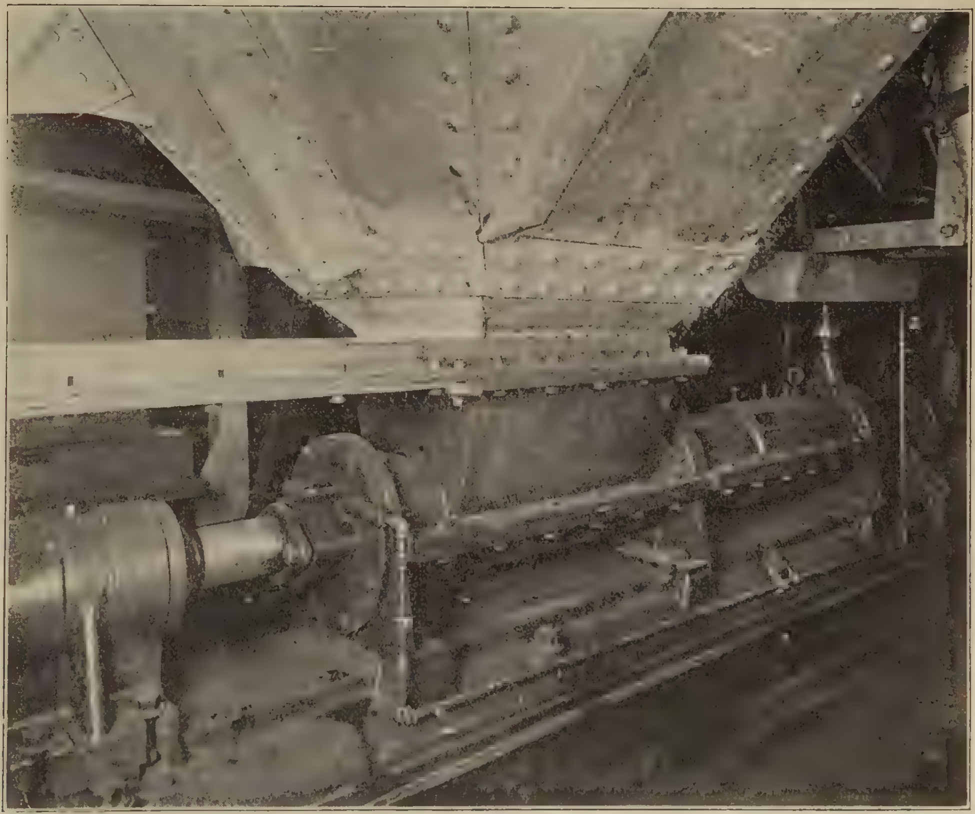


Figure 4. An electrically driven cement pumping system blows cement to shore through 8-inch pipe

scraper of four cubic yards capacity, located in each scraper tunnel, and supported from a traveler running on an overhead trackway and hauled along the scraper tunnels by special steel wires led to two electric haulages. These drag the scrapers along the tunnels, up an inclined path and discharge the cement into a hopper bunker. This in turn feeds through a sliding gate into the archimedean screw of an electrically-driven high-speed cement pump of Fuller-Kinyon manufacture. The cement is then blown overboard through an eight-inch pipe discharge line supplied from two air compressors, each electrically driven by a 208-h.p. motor. To insure adequate protection against leakages into the cement cargo a double skin is fitted on each side of the cargo holds, in addition to wing tanks and cellular double bottom below. Watertight steel covers are also fitted in the cargo hatches.

The special mooring arrangements required on all Canadian canal vessels have received particular attention, and four electric warping winches are fitted, together with an electric snubbing winch with wire compressor, all the motors being fed from the 220-volt supply. An electric steering gear is fitted in the stern and is electrically operated from the wheelhouse, with control rod to a standard on the wheelhouse, arrangements also being made for emergency hand steering. The steering motor is sensitively controlled by a generator and two self-balancing field resistances.

Water ballast is carried in the fore and aft peaks, in the double bottom under the propelling and conveying machinery, in the tunnels, and in the wing tanks at the sides of the cargo holds. Oil fuel is carried in wing tanks and in the cellular double bottom at the aft end of the machinery space.

The Propelling Machinery

The vessel, as already stated, is electrically propelled, the main electricity supply being provided by two tandem generators driven by Polar engines. They are rated at 500 h.p. when running at 220 r.p.m. The engines are of the latest two-cycle airless injection type, embodying exclusive features of design.

The propelling machinery, which was supplied by the General Electric Co., consists of a single-screw motor with power supplied by two Atlas diesel engines, direct coupled to the two tandem generators just mentioned, each main generator having a suitable output for propulsion and cargo auxiliaries. Two small generators for auxiliary purposes are fitted on extensions to the main generator sets. Apparatus is installed on the bridge for the direct control of the reversed and speed variations of the propeller from slow to full speed in either direction by varying the magnetic field of the main generators without breaking any of the main electrical connections between the generators and the propelling machinery.

A special vertical waste heat boiler is provided to supply heat for domestic purposes, waste gases from the diesel motors being utilized at sea, and oil burning in port.

During the trial the vessel was operated under bridge control by the captain, when maneuvers corresponding to the exact conditions met with during docking operations were carried out. These successfully demonstrated the superior operation of the control arrangements as compared with the more usual steam vessel.

Monarch Dividend

Stockholders of the Monarch Cement Company, Humboldt, Kansas, were paid a dividend of 4 per cent on August 1st.

State Cement Plant Biennial Report Shows Increased Profits

A net profit of $90,560.07 for operations of the South Dakota state cement plant during the first six months of 1930 is shown in the third biennial report of the state cement plant commission, which has been filed by Nick Caspers, secretary-treasurer, with the governor's office. In the same period last year the net profit was given as totaling $83,058.65, which is $7,501.42 less than for the first six months of the current year.

Sales for the last six months were given as 245,549 barrels, or an increase of 37,761 barrels over a like period in the beginning of 1929. Total shipments for the biennium were given as totaling 1,059,275 barrels.

Accounts at the cement plant were shown in the report to have been audited by L. H. Sohn, of the division of audits and accounts, who found that the plant at Rapid City is operating at full capacity at the present time and presents the opinion that the plant shortly will be lacking in capacity.

Assets are given as totaling $2,924,639.45, and include $70,779.49 as cash in banks and with state treasurer, $92,230.18 in accounts receivable, and $328,562.74 as inventories; buildings, $768,402.03; land $74,898.77; and machinery, $1,083,137.40, besides other items. Depreciation reserve is given as $446,533.58.

Liabilities include the item of $2,000,000 as the amount of the bond issue with which the plant was built, the appropriation of $24,735.30 made in 1919, $129,428.23 as bond interest during construction, and $639,793.97 in undivided profits.

The profit and loss statement for the first six months of 1930 shows gross sales of $602,296.18 and net at $362,232.21. The cost of goods sold is given as $247,246.70, selling expense as $93,383.80; general administration as $88,206.02, and other income credits as $2,354.05.

Mr. Caspers states in the report that 86 per cent of all the cement used in the state at the present time comes from the state plant and sees "popular" favor for the plant on this account.

Wallowa Company Proposes to Build Plant in Oregon

Announcement that a three million dollar cement plant will be established near Portland, Oregon, was made on July 30th by officers of the Wallowa Lime and Cement Company. Construction will start within three or four months.

The company controls six thousand acres of patented land in Wallowa County, in the center of which is Marble mountain, containing millions of tons of marble. The marble will be quarried and shipped to Portland by rail.

Lewis H. Mills is president of the Wallowa company.

Indo-Chinese Cement Firm Active

The Societe des Ciments Portland Artificiels de l'Indo-Chine, reports from Paris, France, gross profits of 14,716,832 francs and net benefits of 8,250,000 francs for the past year. Capital increased from 12,000,000 to 24,000,000 francs.

Lehigh Regular Dividend

Lehigh Portland Cement Co. declared the regular quarterly dividend of $1.75 on the preferred stock, payable October 1st to stock of record September 3rd.

Estimation of Free Lime in Set Cements

Determined in Form of Calcium Hydroxide — Calorimetric Method Employed—Errors Are Small—Test Procedure Given in Detail

A NEW calorimetric method for the estimation of free lime in portland cement in the form of calcium hydroxide is described by G. E. Bessey in a 25-page publication just issued as Technical Paper No. 9 by the British Department of Scientific and Industrial Research.*

The method employed depends on the fact that calcium hydroxide does not dissociate below 350 deg. C., while dissociation is found to be nearly complete at 550 deg. C. after ignition for half an hour. Samples of the cement under test are dehydrated at each of the above temperatures, after which measurement is made of the difference in the heat evolved on rehydration of the two ignited samples.

Application of Method

The results of the tests indicated that free lime in the form of calcium hydroxide [$Ca(OH)_2$] may be estimated with fair accuracy. The sources of error are few and should not lead to an error greater than one-half of one per cent, by weight, of the samples. Errors of observation in weighing and temperature reading are negligible. The other sources of error are three in number. The first is likely to occur due to the carbonation of free lime during ignition; the second arises through the combination of the free lime with other constituents of the sample during the ignition; the third source of error is due to the incomplete hydration in the calorimeter because of inefficient stirring. Corrections for the first two sources of error are readily made by the correction factors shown, and the combined errors are quite small.

Since no other method of estimating free calcium hydroxide in hydrated cements and like materials is known, by which values can be obtained which are either reproducible or have any physical meaning, the present method should prove a useful adjunct to existing methods of investigating such materials.

A number of results for neat cements and mortars of different composition are shown in the following table:

TABLE 10

Free Calcium Hydroxide in Hydrated Portland Cements and Cement Mortars. CaO (Per Cent) Present as $Ca(OH)_2$

Sample	1 mo.	3 mo.	12 mo.
1. Neat portland cement	8.2	9.05	9.3
2. Neat rapid-hardening portland cement	7.9	9.45	10.35
3. Mortar 2:1, portland cement-sand	5.7	6.4	7.7
4. Mortar 1:1, portland cement-sand	4.25	4.6	5.7
5. Mortar 1:2, portland cement-sand	2.25	2.3	3.3
6. Mortar 1:1, rapid-hardening portland cement-sand	6.0	6.85	----
7. Mortar 1:1, normal portland cement-sand	4.6	4.35	----

The calcium-hydroxide content in the above table is expressed as per cent CaO, present as $Ca(OH)_2$ in the sample dried *in vacuo* over sulphuric acid. The results are of considerable interest. The free-lime content of the cement is seen to increase with age in all cases up to one year. Tests on samples at short periods would indicate the early rates of hydration of the cement. Rapid-hardening portland cements are seen to have a higher free-lime content at equal ages than normal portland, as might be anticipated from the finer state of division. In the mortars, the free-lime content is approximately proportional to the amount of cement in the mortar, for a given cement and age of sample.

The possibilities of application of the method to investigations on the rate and degree of hydration of cements, either neat, or in mortar or concrete, are apparent.

The method is directly applicable to portland cement concretes with inert aggregates, for there is no reaction of these with $Ca(OH)_2$ over the range of temperature used. Limestones may be considered as inert aggregates for this purpose since calcium carbonate does not decompose at 550 deg. C. even when mixed with cement. It should be noted, however, that if free lime is being determined in relation to the fire-resistant properties of a concrete, the CO_2 content should be determined in addition to free lime, and the calcium carbonate present deduced therefrom. This can be done roughly by finding the difference in loss on ignition on heating two samples to 550 deg. C. and 1,000 deg. C. respectively. The results obtained will be slightly high.

In the presence of active additions or aggregates, such as pozzolana or blast furnace slag, there are certain difficulties involved. These materials tend to combine somewhat readily with lime, and it is found that a certain amount of combination takes place during ignition of the samples. It is found, however, that corrections may be applied in the same way as the correction for recombination in portland cement. The full corrections for these materials are not yet completely worked out.

The method has also been applied to certain other building materials containing calcium hydroxide. In the case of hydrated limes and lime mortars (with and without pozzolanic additions) the problem is very similar to that of cement and similar corrections are used. For sand-lime bricks, which are manufactured under different conditions, there are present compounds which are not present in cements, and these necessitate different corrections which have not been fully worked out.

In addition to the determination of calcium hydroxide alone this method of investigation seems likely to prove of considerable utility in the examination of unhydrated or "fresh" cements. Work is being carried out in this connection to investigate whether the method may be useful for determining the initial quality of portland cements and the effects of storage and aeration. A study of the compounds supposedly present in fresh and in hydrated cements is also being made, and it is hoped that some further information concerning the constitution of cements may be gained thereby.

---

*The complete booklet, entitled The Estimation of Free Calcium Hydroxide in Set Cements, may be obtained from the Department of Scientific and Industrial Research, 16 Old Queen St., Westminster St., S. W. 1, London, England, at 6d per copy.

Standardized Method—Routine Procedure

The sample is dried and crushed, preferably out of contact with air containing CO_2, to pass a 100-mesh sieve, and well mixed. About 10 gm. of sample is weighed into a narrow silica or porcelain crucible and ignited in the electric furnace for half an hour at 350 deg. C. ± 10 deg. It is cooled in a desiccator, containing soda-lime and a desiccating agent (preferably P_2O_5) for half an hour, and then brushed into the wide test tube of the calorimetric apparatus. The tube is corked, placed in the calorimeter, the liquid in both calorimeters stirred steadily and the temperature allowed to become steady. The bottom of the tube is then broken by a suitable rod and the contents of the calorimeters well mixed by stirring vigorously for four minutes. At the end of that period the rise in temperature is noted, corrections made for heat losses from the calorimeter, and the heat evolved calculated from the known constants of the latter. The specific heat of the sample may be taken as 0.20 for calculation of the heat evolved.

Procedure Repeated

This procedure is repeated with another sample of similar weight ignited to 550 deg. C. ± 10 deg. C., and the heat evolved calculated as before. From these data the lime content, present as $Ca(OH)_2$ in the sample, is calculated according to the following formula: "Free lime" in terms of

$$\text{CaO (per cent)} = \left(\frac{Q_2}{W_2} - \frac{Q_1}{W_1}\right) \times \frac{100}{273} \times f \times k,$$

where Q_1, Q_2 are the quantities of heat evolved at 350 deg. C. and 550 deg. C. respectively.

W_1, W_2 are the weights of samples used for estimations at 350 deg. C. and 550 deg. C.

273 is the heat of hydration of calcium oxide in calories per gram.

f is a correction factor for incomplete decomposition of $Ca(OH)_2$ at 550 deg. C., and carbonation of sample. It may vary slightly with the furnace used; for the furnace and conditions of the present investigation it was $\frac{100}{93}$.

k is a correction factor for combination of lime with the other materials during ignition. For portland cement it is 1.04.

The three numerical factors above may, for cement, be condensed into 0.410 and used as a single factor.

The time taken for each complete estimation (two determinations of heat of hydration) is about two and a half hours if only one set of apparatus is used.

Rise of Temperatures

The temperatures at the end of four minutes' hydration should be rising very slowly and steadily. If a jerky or rapid rise is observed near the end of this time, a portion of the sample may be incompletely hydrated, due to imperfect breaking of the test tube or other causes, and the test should be repeated. Such a difficulty has been encountered in one or two experiments only, and is easily observed. The error caused in any case would be small.

Announce Program of 19th Annual Safety Congress and Exposition

The outstanding co-operative accident prevention conference of the year for the industry will be held in Pittsburgh from Sept. 29th to Oct. 3rd, as an important feature of the nineteenth annual Safety Congress and exposition.

The program of the Cement Section on Tuesday afternoon and Wednesday morning will not conflict with the program of the Quarry Section on Thursday morning and Thursday afternoon. On Wednesday noon there will be a joint luncheon of Cement and Quarry Sections, and in the afternoon a joint program of the two sections.

The special Cement Section program will include an address by Thos. J. Quigley, chief of the mines and quarries section of the Pennsylvania Department of Labor and Industry. Other special topics will be methods of investigating accidents in the cement industry, and the problem of the foreman in teaching safety to his men.

The joint sessions with the quarry section will include an address by Lieut. Col. Henry A. Reninger, past president of the National Safety Council; and an address by Dr. H. F. Hulbert, on "Mental Self Discipline and Accident Prevention and Safety."

The special congress program for the Quarry Section will include an address on "The Value of Co-operative First Aid Training," by J. J. Forbes, supervising engineer of the Safety Division of the U. S. Bureau of Mines; and another special address on "How We Have Reduced Accidents in the Quarrying Industry," by Mr. Quigley. There will also be a general round table discussion on "Saving Money Through Accident Prevention," led by the general managers of two companies with remarkable safety records.

The Congress program for the Mining Section will include four half-day sessions devoted to discussions of important safety problems. There will be two luncheon sessions of the mining delegates; and one morning session will be devoted to a trip to the experimental mine and explosives testing station at Bruceton, Pa.

The Mining Section program also will include such topics as safety organization for a small company, safety organization for a large compny, and protective clothing in accident prevention.

Penn-Dixie Earnings

The Pennsylvania-Dixie Cement Corporation for the twelve months ended June 30th, shows net of $304,553 after depreciation, depletion, interest and federal taxes, equivalent to $2.24 a share on 135,888 shares of 7 per cent preferred stock, against $975,813 in the preceding twelve months, equal after dividends on 7 per cent preferred to six cents a share on 400,000 no-par shares of common.

At present selling prices, the company states, indications are that earnings the last six months of the year should exceed the last half of 1929.

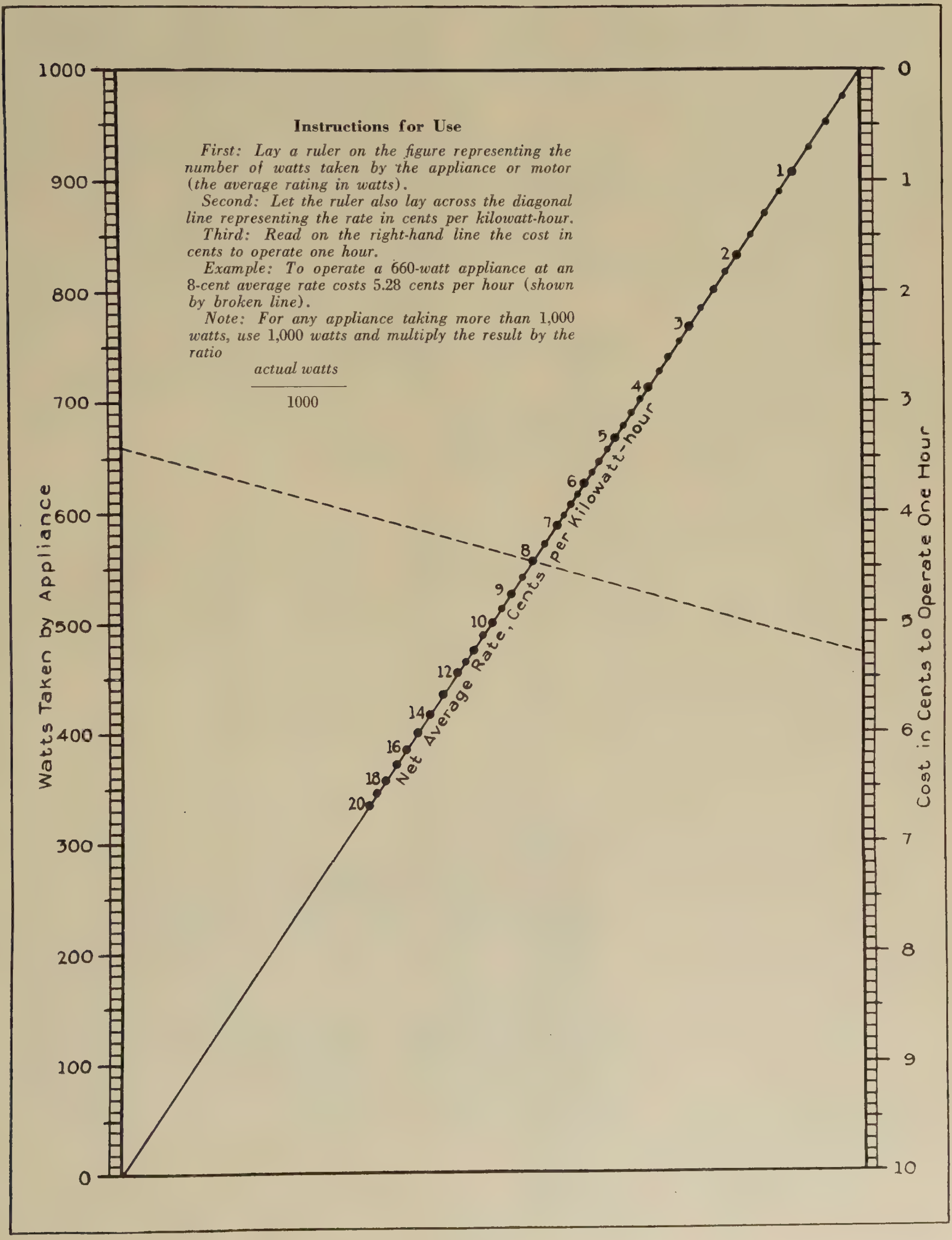
South Carolina State Plant Still Probable

Prospects are "bright" for a state cement manufacturing plant for South Carolina, according to a statement made by C. E. Jones, state highway commission chairman. The plant, he is reported to have said, would be of such proportions that its output would be available for the commercial market as well as for state road work.

No report is available on the status of any legislative action.

Chart to Determine Cost of Operating Electric Appliances and Motors

This chart is reproduced through the courtesy of the Iowa Project on Rural Electrification, Engineering Experiment Station, Iowa State College, Ames, Iowa. A special distribution of the chart is being made by the General Electric Company, Schenectady, N. Y., from whom copies may be obtained upon request.



Instructions for Use

First: Lay a ruler on the figure representing the number of watts taken by the appliance or motor (the average rating in watts).

Second: Let the ruler also lay across the diagonal line representing the rate in cents per kilowatt-hour.

Third: Read on the right-hand line the cost in cents to operate one hour.

Example: To operate a 660-watt appliance at an 8-cent average rate costs 5.28 cents per hour (shown by broken line).

Note: For any appliance taking more than 1,000 watts, use 1,000 watts and multiply the result by the ratio

$$\frac{\textit{actual watts}}{1000}$$

Cement Statistics for July

Both Production and Shipments for Month Show Decreases—Stocks Higher by 7 Per Cent

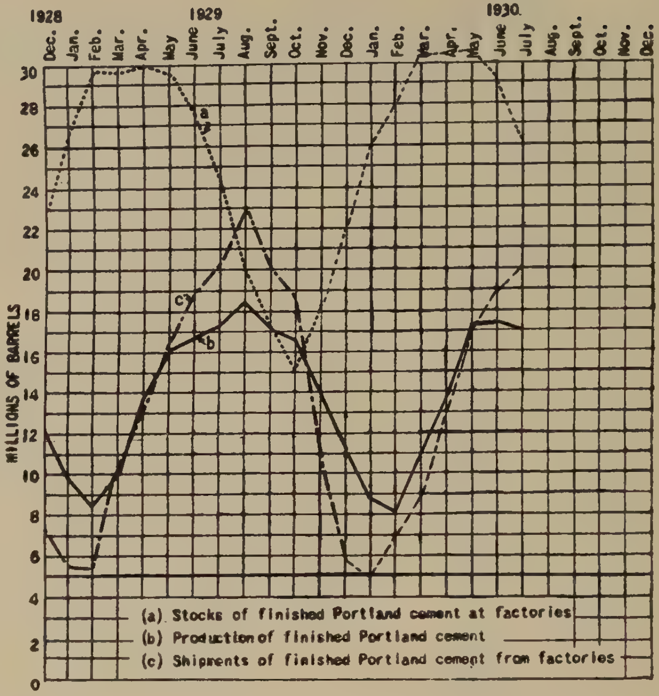
	1929	1930	Increase or Decrease(—) Per Cent
Production, July	**17,315,000**	17,080,000	—1.4
Shipments, July	**20,319,000**	20,147,000	—0.8
Stocks at end of July	24,525,000	**26,298,000**	7.2
Total production for year to date	92,355,000	**92,974,000**	0.7
Total shipments for year to date	**90,567,000**	90,285,000	—0.3
No. of plants reporting	163	**166**	2.0

NOTE: IN ORDER THAT THE READER MAY KNOW THE TREND AT A GLANCE, THE HIGHER FIGURE, WHETHER FOR EITHER YEAR, UNDER ANY CLASSIFICATION, APPEARS IN SLIGHTLY HEAVIER TYPE.

Relation of Production to Capacity

(Figures represent per cent)

	July 1929	July 1930	June 1930	May 1930	April 1930
The month	**80.4**	77.8	81.4	78.9	64.0
The 12 months ended	**68.9**	66.1	66.4	66.2	66.0



Production, Shipments, and Stocks of Finished Portland Cement, by Districts, in July, 1929, and 1930, and Stocks in June, 1930

District	Production—July 1929	Production—July 1930	Shipments—July 1929	Shipments—July 1930	Stocks at end of month 1929	Stocks at end of month 1930	Stocks at end of June, 1930*
Eastern Pa., N. J. and Md.	**3,709,000**	3,566,000	**4,171,000**	4,085,000	5,389,000	**5,994,000**	6,513,000
New York and Maine	**1,366,000**	1,249,000	**1,609,000**	1,524,000	**1,765,000**	1,462,000	1,737,000
Ohio, Western Pa. and W. Va.	**2,139,000**	1,973,000	2,282,000	**2,358,000**	3,435,000	**3,522,000**	3,908,000
Michigan	**1,432,000**	1,410,000	**1,950,000**	1,604,000	1,979,000	**2,619,000**	2,812,000
Wis., Ill., Ind. and Ky.	**2,354,000**	2,255,000	2,837,000	**2,916,000**	3,168,000	**3,931,000**	4,591,000
Va., Tenn., Ala., Ga., Fla. and La.	**1,250,000**	1,213,000	**1,543,000**	1,327,000	1,818,000	**1,887,000**	2,001,000
Eastern Mo., Iowa, Minn. and S. Dak.	1,570,000	**1,832,000**	2,223,000	**2,540,000**	**3,092,000**	2,495,000	3,203,000
W. Mo., Neb., Kan., Okla. and Ark.	1,159,000	**1,405,000**	1,382,000	**1,442,000**	1,269,000	**1,688,000**	1,725,000
Texas	**701,000**	585,000	666,000	**709,000**	546,000	**564,000**	688,000
Colo., Mont., Utah, Wyo. and Idaho	**322,000**	219,000	**299,000**	270,000	**529,000**	511,000	562,000
California	991,000	**1,009,000**	**995,000**	946,000	991,000	**1,143,000**	1,080,000
Oregon and Washington	322,000	**364,000**	362,000	**426,000**	**544,000**	482,000	544,000
	17,315,000	17,080,000	**20,319,000**	20,147,000	24,525,000	**26,298,000**	29,364,000

Production, Shipments, and Stocks of Finished Portland Cement, by Months, in 1929 and 1930

Month	Production—July 1929	Production—July 1930	Shipments—July 1929	Shipments—July 1930	Stocks at end of month 1929	Stocks at end of month 1930
January	**9,881,000**	8,498,000	**5,707,000**	4,955,000	26,797,000	**27,081,000**
February	**8,522,000**	8,162,000	5,448,000	**7,012,000**	**29,870,000**	28,249,000
March	9,969,000	**11,225,000**	**10,113,000**	8,826,000	29,724,000	**30,648,000**
April	**13,750,000**	13,521,000	13,325,000	**13,340,000**	30,151,000	**30,867,000**
May	16,151,000	**17,249,000**	16,706,000	**17,224,000**	29,624,000	**30,891,000**
June	16,803,000	***17,239,000**	**18,949,000**	*18,781,000	27,505,000	***29,364,000**
July	**17,315,000**	17,080,000	**20,319,000**	20,147,000	24,525,000	**26,298,000**
August	18,585,000		23,052,000		20,056,000	
September	17,223,000		19,950,000		17,325,000	
October	16,731,000		18,695,000		15,381,000	
November	14,053,000		11,222,000		18,213,000	
December	11,215,000		5,951,000		23,550,000	
	170,198,000		169,437,000			

*Revised.

MEN and MILLS

Notes from the Field

Druckenmiller Appointed Assistant Sales Manager of Penn-Dixie

The Pennsylvania-Dixie Cement Corporation announces the appointment of B. W. Druckenmiller as assistant general sales manager, with headquarters at 521 Fifth Avenue, New York City, effective August 15th.

For the past two years Mr. Druckenmiller has been sales manager of Penn-Dixie. He was formerly connected with the Crescent Portland Cement Company, Wampum, Pa., for a period of more than sixteen years.

Lightning Strikes Quarry Charges; Blaster Killed

Lightning caused a premature explosion of eight tons of dynamite early in the day of July 22nd and the instant death of George Sam, chief blaster.

The explosion happened on the north face of the quarry, adjoining the plant. Dynamite charges had been placed in more than a score of holes, each drilled about 100 feet deep and about 20 feet apart. A sudden bolt of lightning and roll of thunder rent the air and this was followed by a low rumbling sound of dynamite charges taking effect. The blast was to have been set off as part of an inspection tour of a group of company officials from Philadelphia, who were expected during the afternoon.

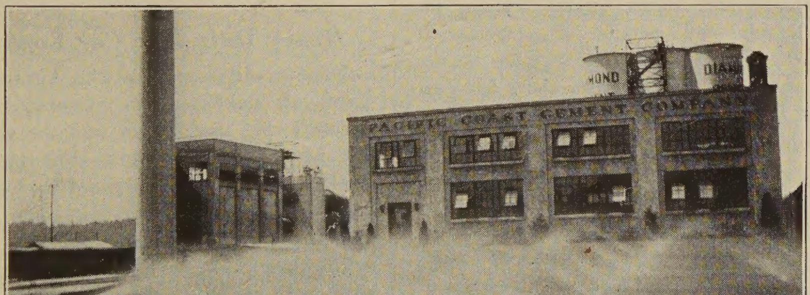
Sam was an expert blaster and had active charge of all blasting operations in the quarry. He had been in the employ of the Keystone Company since the establishment of the Bath plant about two years ago. He had formerly been employed in a similar capacity with the Lehigh Portland Cement Co.

Two Bands Turn Out for Wellston Safety Rally

Arrangements for a safety meeting were being made recently at the Wellston Iron Furnace Company cement plant at Superior, Ohio, cement plant of the Wellston Iron Furnace Co. when it was decided that music was necessary to assist in "pepping" things up.

A call was made for musicians and on the eve of the celebration, when the small village turned out en masse, two local-talent bands appeared. Their friendly efforts to outdo each other proved one of the features of the rally.

Green Lawns



Fresh, green lawns appear doubly pleasant in drought-ridden days and the Pacific Coast Cement Company uses a spray sprinkling system to keep the grass on its grounds in good shape

F. J. Selinger, Jr., Made Penn-Dixie Sales Manager

The appointment of F. J. Selinger, Jr., as sales manager, is announced by the Pennsylvania-Dixie Cement Corporation as of August 15th. His headquarters will be at 521 Fifth Avenue, New York City.

Mr. Selinger became associated with the Penn-Dixie organization some months ago. During the preceding twenty-three years he was connected with the Atlas Portland Cement Company.

Benefit Club Assists Monarch Employees

Employees of the Monarch Cement Company plant at Humboldt, Kansas, have organized the Monarch Benefit Club for the purpose of assisting fellow members during illness or injury, and report it as working out in a highly satisfactory way.

The amount of $2.15 a day is paid when a man has been out seven days or not more than 46½ days. One hundred dollars is paid for any one claim in a calendar year.

Blast Furnace Explosion Kills Two at Peerless Plant

An explosion of coal dust fatally burned two men in the plant of the Peerless Cement Corporation plant at Port Huron, Michigan, on August 4th. Elmer F. Rowe, 39, assistant superintendent, and Frank Young, 35, coal mill operator, were inspecting the powdered coal room, and upon opening a blast furnace were hurled across the room.

Neither regained consciousness after the blast.

Monarch Employees Nine Plays Twice Weekly

Employees of the Monarch Cement Company at Humboldt, Kansas, are making use of the baseball diamond built for them by the company. An average of two games a week are played.

Besco Returns from Tour of Canada

Ted Besco, chief chemist of the Superior, Ohio, cement plant of the Wellston Iron Furnace Co., has returned to his work after an extensive tour of Canada.

Mill Equipment

New Extended-Surface Economizer of Fin-Tube Type

Combustion Engineering Corporation has recently placed on the market the C-E Economizer, fin-tube type.

This economizer can be installed in considerably less than half the space required for a straight, plain-tube economizer of equivalent heating surface, it is stated. The principal features are the external return bends, the internal return bends, the tube arrangement and the use of finned tubes which provide additional heat-absorbing surface.

The heat-absorbing elements are constructed by connecting a U-bend to two straight tubes and so forming a U-tube. The open ends of each U-tube are connected serially by return bends located outside the end-plates, to the tubes directly above and below. The adjacent vertical tube sections are arranged so that the open ends of the U-tubes alternately enter one end and the other of the economizer casing.

The water circulation is separated into two circuits, one running through the U-tubes connected by the return bends at one end of the economizer and the other through the U-tubes connected by return bends at the opposite end. A distinct advantage of the two separate water circuits is that the water flows through only one-half the tube distance as compared with the plain-tube, single-circuit type of economizer. With extended surface in the form of fins, the tube length is still further reduced, resulting in such a decrease in the frictional resistance that the water pressure drop is about one-fifth that of the plain-tube, single-circuit type of economizer. Both circuits are served by common inlet and outlet headers.

The compactness of the unit is derived principally from the fin-tube design which reduces the tube-length per square foot of heating surface, and the return bend arrangement which permits the tubes to be nested closely together so that the space they occupy is less than half the space required for a straight tube economizer of equal heat-absorbing surface, the manufacturer states. The end plates are designed to permit their being quickly and easily removed for the inspecting and cleaning of the tubes.

INDUSTRIAL LITERATURE

Waste Heat Boiler Bulletin

A new bulletin describing waste heat boilers differing from those used in the past has just been issued by the *Foster Wheeler Corporation,* New York City.

The boilers consist of heating elements built of seamless steel tubes covered with cast iron extended surface, reamed to size and shrunk on the heating tubes. They are more compact per square foot of heating surface than has previously been possible, it is stated.

The boilers described are not new, as several of them have been in operation for more than a year. The first installations were made in connection with the exhaust gases from Diesel engines. It has been found that in this service the boilers act as excellent mufflers, no additional muffling devices being used under ordinary conditions.

Another interesting departure from usual boiler practice is that when operated with waste heat gases not exceeding 800 deg. F., it is not necessary to by-pass the boilers for protection, even when dry, the manufacturer states.

The boilers may thus be run as flash boilers, the steam production being controlled by setting the feed valve for the desired steam quantity. A further characteristic of much interest to operators is the self-cleaning tendency, it having been found that the exhaust gases from Diesel engines tend to keep the heating surface clean so that soot blowing is eliminated when operating on exhaust gases from internal combustion engines.

The catalog shows several designs, installations and details of construction which will be of interest to those having waste gases at temperatures above 500 deg. The bulletin is known as WB-30-2 and is available upon request.

Explosives Chart

A bulletin dated July and entitled "*Brands of du Pont Explosives and Uses to Which They Are Adapted,*" consists of a sixth edition of a chart issued for the purpose of aiding users of explosives to avoid the purchase of unsuitable explosives and to select those which will give the best results in proportion to cost. The chart has been revised to include new explosives added to the list of du Pont brands during the past year.

Copies are available from the *E. I. du Pont de Nemours & Co.,* Wilmington, Delaware.

Link-Belt Data Book on Belt Conveyors

Link-Belt Company, Chicago, has prepared a 176-page data book, *No.* 1615, on belt conveyors. This flexible covered book has been prepared to facilitate the selection and application of the proper type of belt conveyor for handling any material in quantities desired.

Following are some of the subjects discussed: Belt conveyor drives; belt stresses; care, lubrication and maintenance of belt conveyor idlers; diagrams of typical belt conveyors; dimensions, prices and data concerning various types of idlers and driving mediums; engineering charts, data and suggestions, and feeders and their selection.

Manganese Publication

The August issue of "*The Amsco Bulletin*" contains descriptions of several pieces of equipment of interest, among them manganese steel bucket frame castings and steel crane wheels.

This is the monthly publication of the *American Manganese Steel Company,* Chicago Heights, Ill.

Conveyor Life

The August issue of "*Link-Belt News*" contains an article on "*How to Make Conveyors Last Longer,*" in which an engineer experienced in the sale and application of elevating, conveying and power transmitting equipment, points out some facts to be observed when purchasing such units.

The publication is issued monthly by the *Link-Belt Company,* Chicago.

Heavy Duty Box Car Loader

Stephens-Adamson Mfg. Co., Aurora, Ill., have just published two illustrated data sheets giving descriptions and the specifications of their new heavy duty box car loader and also their standard loader that has been on the market for some time. A new use featured for these portable loaders is their throwing of bulk materials far enough to distribute the cargo in the hold of freight boats.

Electric Control

A publication issued recently on *Reeves Variable Speed Transmission* deals with new electric automatic control and electric remote control devices. Each is illustrated and described in some detail.

The *Reeves Pulley Company,* Columbus, Ind., is the manufacturer.

With the Manufacturers

INDUSTRIAL LITERATURE

EC&M Bulletins on Control and Compensator

The new *Bulletin* 920, published by the *Electric Controller & Mfg. Co.*, Cleveland, Ohio, describes EC&M time-current magnetic control for direct current motors. The information given is said to be a true representation of the conditions as they actually exist on various crane, mill, machinery and material handling equipment drives. Numerous references are made throughout this bulletin to difficult or complicated control problems.

Bulletin 1047-*A* supersedes Bulletin 1047, describing the EC&M 2300 volt automatic compensator. Ratings of the compensator have been revised and are now based upon the starting inrush current of the motor given in per cent of full load current. This new method of ratings will permit the selection of the proper price of the compensator which will be exactly suited for the motor.

Price Sheet 1047-A, applying to these compensators, contains prices in accordance with these revised ratings and now permits a selection of 5 sizes of compensators.

First Catalog on C-E Economizer

A new catalog which presents a detailed and well illustrated description of the C-E Fin-Tube Economizer, developed by *Combustion Engineering Corporation* and incorporating several novel and highly advantageous features of design, has just been published.

Among the most important of these features is the arrangement of the finned U-tubes, making possible the installation of this economizer in less than half the space required for a straight, plain-tube economizer, it is stated.

Some of the other important features of design presented are, fewer return bend joints; high rate of heat transfer; low water pressure drop and ease of accessibility for cleaning and inspection.

Laboratory Air Unit

Its application and operation, together with the results secured, are described in some detail in a folder, *Bulletin* 25, on the Federal laboratory air separating unit of the *Federal Pneumatic Systems, Inc.*, Chicago.

"Maximum yield is obtained with the Federal separator owing to thorough diffusion. The air entering the mesh valve passes through the aggregate in precipitation, it is stated, and any considerable amount of fines in the rejects may be charged to physical characteristics of the material. The unit is replacing test sieves in portland cement plants, both in the laboratory and finished department."

Linatex Publications

Wilkinson process rubber, or Linatex, is described in detail in a 24-page booklet lately published by the *Wilkinson Process Rubber Sales Corporation,* Chicago. Numerous industrial applications are outlined.

Brookville Locomotives

Bulletin B-4-*AA*-1, published by the *Brookville Locomotive Company,* Brookville, Pa., describes its new Ford powered locomotives, utilized for light haulage in 2, 2½, 3, 3½ and 4 ton sizes.

Direct-Current Motors

Type MPC direct-current motors are described in a 4-page loose leaflet issued in July by the *General Electric Company,* Schenectady, N. Y.

Complete Caldwell Line of Drives

Book No. 1191, illustrating and describing the complete line of Caldwell screw conveyor drives, has just been published by *H. W. Caldwell & Son Co.,* Chicago, Illinois.

The 32 pages of this book are devoted to illustrations of these drives, typical installations of the equipment, and engineering data enabling the selection, without confusion, of the most efficient and economical drive for the individual purpose.

These drives form one of three groups of standardized drives which are carried in stock for prompt shipment. The other two are Caldwell standardized drives for bucket elevators, and Caldwell standardized drives for belt conveyors. The drives in the three groups are of the same general construction, but the range of sizes and speeds is adapted in each case to the particular field covered.

Fire Brick Manufacture Pictured

An informative booklet on kiln brick manufacture is that just published by the *A. P. Green Fire Brick Company,* Mexico, Mo. The story is told completely in pictures accompanied by brief explanatory notes.

NOTES FROM THE FIELD

New Haynes Stellite Foundry

Haynes Stellite Company, Kokomo, Ind., a unit of Union Carbide and Carbon Corporation, has announced the completion of a new foundry at the Kokomo works, which has been built expressly for the manufacture of the *Hastelloys,* a group of new acid resistant alloys. The most up-to-date and efficient foundry equipment procurable has been installed to insure careful control of quality and uniformity of product, it is announced.

Hercules Laboratory Cornerstone Laid

Laying of the cornerstone of the main buildings of the new experimental and research laboratories of the *Hercules Powder Company* took place at Hercules, near Wilmington, Del., on July 30th.

President Russell H. Dunham was presented by *George M. Norman,* technical director, and delivered an address.

Plant for Link-Belt

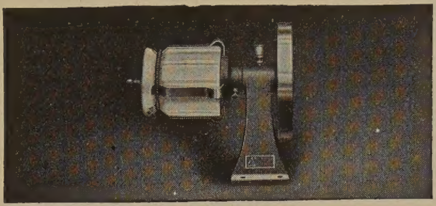
Link-Belt Company, Pacific division, has just moved into their new manufacturing plant and office, located at Paul Avenue near Bayshore Highway, San Francisco, Calif., from their old plant in a different section of the city.

This added unit to Link-Belt's 16 plants and warehouses, located throughout North America, consists of a two-story office building, a warehouse 80 feet by 120 feet, three stories high, and the manufacturing building, containing the machine shop, steel shop, plant office and their auxiliary departments.

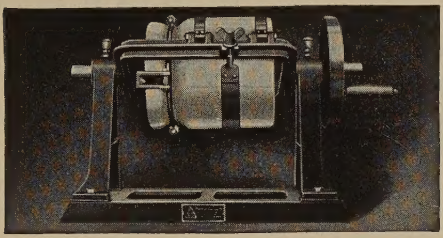
Power Transmission Representatives

The Chain Belt Company, Milwaukee, Wis., has appointed *E. C. Atkins and Company, Inc.,* of Memphis, Tenn., as chain and power transmission representatives. The Atlanta office of the company has recently been moved to 407 and 408 Bona Allen Building, Atlanta, Ga.

Laboratory Apparatus for Cement Testing



3674 MILL—Pebble, Single Specimen Type, hand or pulley driven, for grinding or mixing small quantities of substances without contaminating them in any way with metal. The porcelain jar is 5.2 by 5.7 inches and has a dry capacity of ¼ oz. to 1½ lbs. (taking sand as a unit) or a wet capacity of 1 quart. The pulley is 9 by 1 inches and requires 1/12 horsepower when motor driven. Should be operated at 80-120 r.p.m. Complete with 2 lbs. of selected flint pebbles **$16.00**



3682 MILL—Pebble, Assay Type, hand or pulley driven, for grinding or mixing chemicals, enamels, minerals, ores, paints, etc., without contaminating them with metals. The porcelain jar is 8.75 by 9.6 inches and has a dry capacity of 1 oz. to 5 lbs. (taking sand as a unit) or a wet capacity of 1 gallon. The pulley is 9 by 1 inches and requires 1/12 horsepower when motor driven. Should be operated at 55-75 r.p.m. Shipping weight 125 lbs. Complete with 8 lbs. of selected flint pebbles **$35.00**

3683 MILL—Pebble, as above but with tight and loose pulley **$37.00**

For a complete listing of Cement Testing Apparatus and Chemical Laboratory Apparatus refer to Catalog C. Write for a copy if you do not have one.

THE CHEMICAL RUBBER CO.
Laboratory Apparatus and Chemicals
West 112th Street and Locust Avenue
Cleveland, Ohio

Decomposing Aluminous Silicates for Chemical Analysis

Sintering Method Recommended by Finn and Klekotka—Procedure Given in Research Paper

A modified method for decomposing aluminous silicates for chemical analysis is given in Research Paper No. 180, a 6-page reprint from the United States Bureau of Standards *Journal of Research* for June, 1930.

The authors, A. N. Finn and J. F. Klekotka, report that certain silicates of alumina and allied compounds can be decomposed for chemical analysis with relatively small amounts of sodium carbonate (Na_2CO_3). Satisfactory decomposition was obtained by heating a half-gram sample with six-tenths of a gram of sodium carbonate at 875 deg. C. for two hours.

Although the work described is based on tests of a relatively few kinds of aluminous silicates, it is thought that the method given below can be applied to other silicates by making proper adjustments between the amounts of the silicate sample and the sodium carbonate used, and adjusting the time and temperature of sintering. The method should be especially useful to chemists who frequently analyze materials of the same general nature, because after having determined the particular conditions best suited to the sintering of their samples, the time required for thoroughly decomposing the sample will be shortened with no sacrifice of accuracy. In fact, the accuracy may be increased because the solvent action of excessive amounts of sodium chloride on silicic acid in a hydrochloric acid solution is largely eliminated, and the amount of foreign salts to be washed out of precipitates is greatly reduced.

In the procedure given below, only the essential details of the sintering method are given. For other details readers are referred to a paper on the analysis of bauxite, by Lundell and Hoffman, published as Research Paper No. 5 in the July, 1928, issue of the United States Bureau of Standards *Journal of Research*. The procedure recommended by Finn and Klekotka is given in the paragraph that follows.

> "Thoroughly mix 0.5 g of the powdered material and 0.6 g of powdered anhydrous Na_2CO_3 in a platinum crucible by stirring them with a glass rod for at least five minutes. Heat the covered crucible and its contents at 875 deg. C. for two hours. Cool, add 1 or 2 ml of water, digest for about 10 minutes, and then stir, or grind if necessary, to break up all particles as completely as possible. Wash the contents of the crucible into a beaker or casserole, using not more than 50 ml of water. Heat to boiling, and with constant stirring, rapidly add about 20 ml of concentrated HCl (specific gravity 1.19). Crush any gritty particles that remain as much as possible with a glass rod and evaporate the solution to dryness. Frequent stirring aids evaporation. Finally heat at 105 deg. to 110 deg. C. for one hour to complete the dehydration of the SiO_2. Cool, add 20 ml of HCl (specific gravity 1.19), digest until effervescence of HCl ceases, add 100 ml of water, boil or digest with occasional stirring until all the aluminum compounds are in solution, filter through a 7 cm No. 40 Whatman or similar paper, and wash the precipitated SiO_2 first with hot dilute HCl (5 parts of concentrated HCl and 95 parts of water) and finally with hot water. Ignite the SiO_2 to constant weight and treat it with HF and H_2SO_4 in the usual way. Heat the residue and correct the initial weight of the SiO_2 accordingly. For more precise work, a second evaporation for residual SiO_2 should be made."